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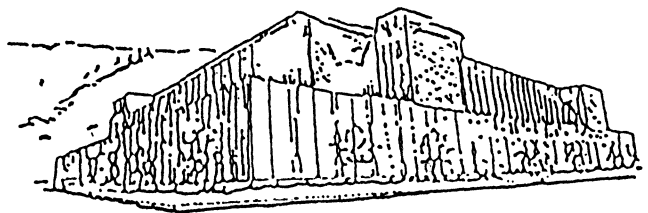
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Status and Management of  
Forest Carnivores on the  
Beaverhead-Deerlodge National Forest

by

Benjamin R. Conard, Wildlife Biologist  
Dillon Ranger District, Beaverhead-Deerlodge National Forest

B.S., Wildlife Biology, The University of Montana. 1991

A PROFESSIONAL PAPER

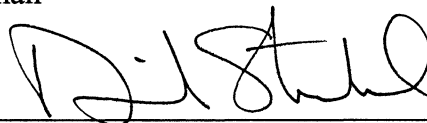
presented in partial fulfillment of the requirements  
for the degree of

Master of Science, Wildlife Biology  
The University of Montana  
December 2000

Approved by:



Robert Ream  
Chair



Dean of Graduate School

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Abstract of the professional paper of Benjamin R. Conard for the degree of Master of Science in Wildlife Biology presented on December 20, 2000. Title: Status and Management of Forest Carnivores on the Beaverhead-Deerlodge National Forest.

Approved: RR  
Robert Ream

## ABSTRACT

The status and management of four forest carnivores, American marten (*Martes americana*), fisher (*Martes pennanti*), lynx (*Lynx canadensis*) and wolverine (*Gulo gulo*), is of increasing concern. I examined how the Beaverhead-Deerlodge National Forest (B-D NF) manages these animals and recommended some changes. I summarize what is known of the forest carnivores. I reviewed some landscape assessments and summarized the relevant findings. I examined how some Forest Service rules, programs, and procedures affect our activities. Finally, I communicated my findings to fellow biologists and developed management recommendations.

All subunits of the B-D NF support populations of at least one of the forest carnivores. The landscape assessments provided a wealth of information but are generally deficient in addressing forest carnivores. Some of the landscape assessments will need addendums to contribute forest carnivore management recommendations to forest plan revision.

The forest plans did not provide specific tools to manage or monitor forest carnivores, however, the Forest Service recently released new planning regulations. To position itself for the future, the wildlife program can improve to better manage forest carnivores. We must improve our database, GIS, and information management and detections methods. Monitoring responsibility needs clarification and we need to develop a forest carnivore monitoring strategy. Environmental impact analysis remains the primary function of wildlife biologists on the B-D NF. These duties can be greatly enhanced by better workload management, improved assessment techniques, and internal peer review. Habitat enhancement projects can be achieved through close coordination with programs such as silviculture or fire. We must improve our information exchange with other agencies, identify and nurture partnerships, and work more proactively with stakeholders. Biologists must become more involved in program management. We need to articulate to line officers what a healthy wildlife program looks like and what will suffer with inadequate funding and support.

With support and cooperation, we can manage forest carnivores in a manner that provides better protection, is more efficient, contributes toward agency goals, provides state-of-the-art support, and builds customer satisfaction.

## **ACKNOWLEDGEMENTS**

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Thanks to the wildlife biologists who supervised me through the first decade of my career, especially Jeff Jones for introducing me to both the Forest Service and the forest carnivores, David Horning who demonstrated the art of interdisciplinary work, and Jina Mariani who led me through my first years as a district biologist.

Fellow biologists Lorraine Clough, Joe Harper, Tom Komberec, Ron Wiseman, and Dave Wroblewski reviewed my draft and provided many helpful recommendations. Many dedicated, anonymous Forest Service employees laid the foundation upon which my work was built.

Most of all, thanks to my mother Rita and my father Dave, who instilled in me a passion for wildlife and the outdoors and gave me the tools to chase my dreams, and to my wife Melissa, whose sacrifice, encouragement, and patience made completion of my work possible.

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## INTRODUCTION

The status and management of four forest carnivores, American marten (*Martes americana*), fisher (*Martes pennanti*), lynx (*Lynx canadensis*) and wolverine (*Gulo gulo*), is of increasing concern to the public, wildlife biologists, and natural resource agencies. These four species were the subject of a Forest Service conservation assessment because of their large land area requirements, their affiliation with old-aged forests, their viability risks, and the relative lack of information available for conservation planning (Ruggiero et al. 1994). Several publications in the last decade provide outstanding references and management recommendations for these species (e.g., Butts 1992a, Butts 1992b, Weaver 1993, Heinemeyer and Jones 1994, Ruggiero et al. 1994, Zielinski and Kucera 1995, Ruediger et al. 2000, Ruggiero et al. 2000a). My intent was not to duplicate these publications, rather I examined the manner in which the forest carnivores are managed on the Beaverhead-Deerlodge National Forest (B-D NF) and offer some program management recommendations. My findings may be applicable to programs on other national forests or other agencies.

In ten years with the Forest Service, I found that even district biologists, those directly responsible for assessing management activities affecting wildlife, were frustrated by lack of local information, scattered occurrence data, and literature not directly applicable to local conditions. Even the best information available is of little use if local biologists do not realize that an animal indeed occurs in a given area and may be affected by management activities. By compiling our collective knowledge about these species in our local situation, we can identify information gaps, focus detection efforts,

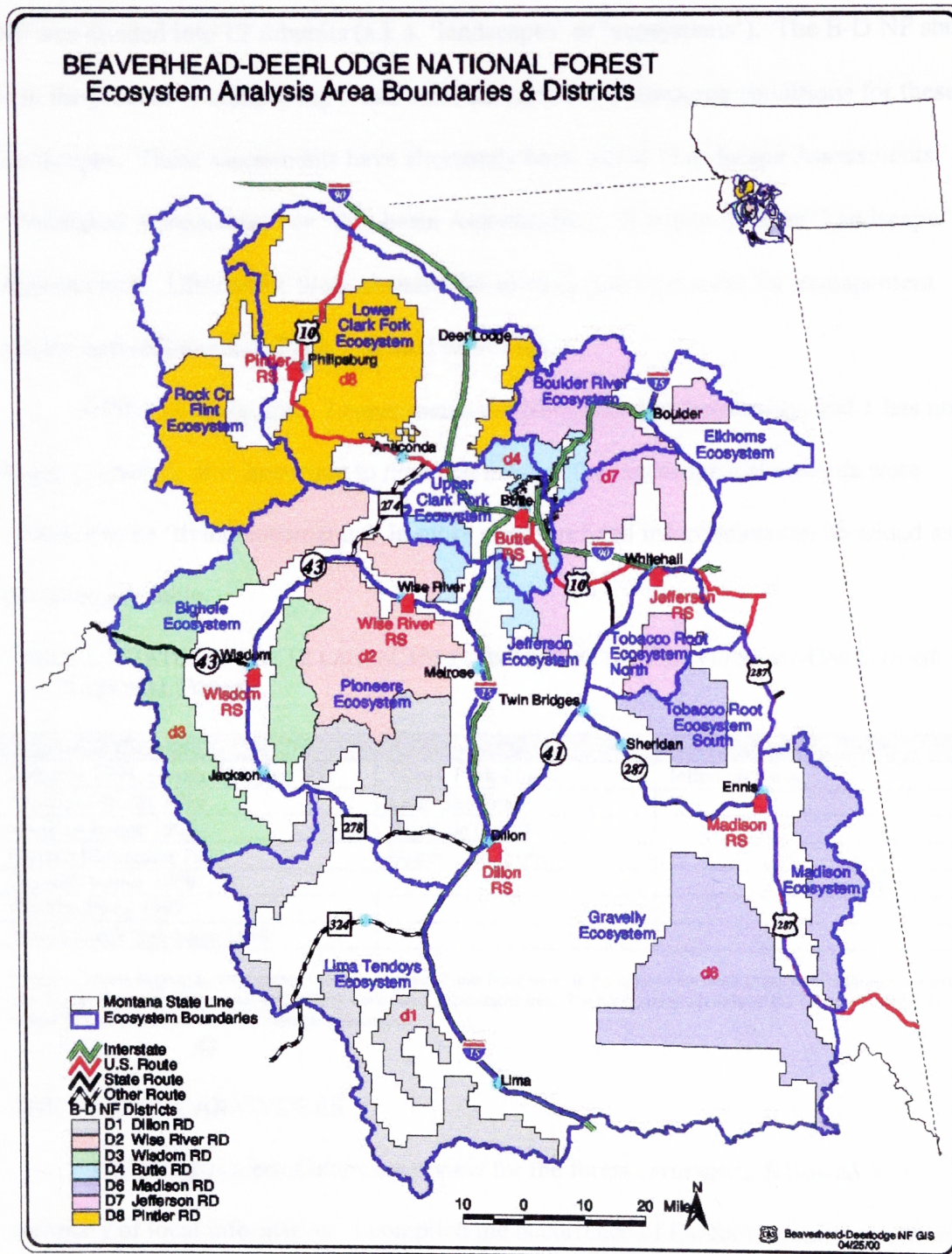
manage our information, better assess land use activities, implement recovery plans, plan habitat enhancement projects, and revise agency plans.

In part one of this three-part document, I summarized what is known of the forest carnivores through the literature and locally. In part two, I reviewed the B-D NF Landscape Assessments (described later) and provided a summary of both the forest carnivore findings and some habitat factors that may affect forest carnivores (such as vegetation trends, recreation issues, or fire ecology). Part two draws heavily from the texts of the landscape assessments. I generally acted only as an editor for these sections but inserted comments and clarifications. In part three, I reviewed how some Forest Service rules, programs and procedures affect how we manage forest carnivores and recommended some changes.

## STUDY AREA

The Beaverhead-Deerlodge National Forest (B-D NF) is the largest national forest in Montana (Fig. 1). It covers 3.32 million acres (13,435 km<sup>2</sup>), and lies in 8 Southwest Montana counties (Granite, Powell, Jefferson, Deer Lodge, Silver Bow, Madison, Gallatin and Beaverhead). Administrative offices are located in Butte, Dillon, Philipsburg, Deer Lodge, Whitehall, Boulder, Ennis, Sheridan, Wise River, Wisdom, and Lima. The B-D NF Supervisor's Office (headquarters) is located in Dillon with an annex in Butte.

FIGURE 1. THE BEAVERHEAD-DEERLODGE NATIONAL FOREST AND ITS SUBUNITS.



As part of ongoing planning, and in preparation for Forest Plan revision, the B-D NF was divided into 12 subunits (a.k.a. 'landscapes' or 'ecosystems'). The B-D NF staff is in the process of completing broad-scale assessments of resource conditions for these landscapes. These assessments have alternately been called "Landscape Assessments" or "Watershed Assessments" or "Sub-basin Assessments." I refer to them as 'Landscape Assessments.' Ultimately, these assessments identify potential areas for management actions and recommend changes to the Forest Plan.

Of the 12 landscapes, 7 assessments are complete, 4 are underway, and 1 has not begun (Table 1). It is important to note that most of the landscape assessments were intended to be 'living documents.' In other words, refined information can be added as it becomes available.

TABLE 1. STATUS OF THE 12 LANDSCAPES COMPRISING THE BEAVERHEAD-DEERLODGE NATIONAL FOREST.

Assessment Complete	Assessment Started	No Assessment to date
Elkhorns 1993, (south Elkhorns '97)	*Clark Fork-Flints	Jefferson River
*Tobacco Roots 1994	Lima-Tendoys	
Madison Range 1995	Big Hole (west)	
Pioneer Mountains 1998	Upper Clark Fork	
Gravelly Range 1999		
Boulder River 1997		
*Rock Creek Sub-basin 1999		

\* Figure 1 shows slightly different names. The 'Rock Creek-Flints Ecosystem' is the same as the Rock Creek Sub-basin Review area. The 'Lower Clark Fork Ecosystem' is the Clark Fork-Flints Assessment area. The north and south units of the Tobacco Roots were combined for the Tobacco Roots Landscape Assessment.

## THE FOREST CARNIVORES

Following is a brief literature review for the forest carnivores, followed by a summary of local information. I compiled the occurrence of the forest carnivores from a variety of sources, including some state trapping records, results of any systematic surveys, records of reliable anecdotal sightings, and additional disclosures of the

landscape assessments. All 12 landscapes support populations of at least one of the four forest carnivores (Table 2). Occurrence data varies in quality according to intensity of past trapping efforts, survey efforts, and anecdotal sightings. We should assume that these species occur in suitable habitats even if they have not been detected. Indeed, because so few studies or surveys exist of some of these species, we should be cautious of what we say ‘is’ or ‘is not’ suitable habitat.

TABLE 2. STATUS OF THE FOUR FOREST CARNIVORES IN EACH OF THE 12 LANDSCAPES COMPRISING THE BEAVERHEAD-DEERLODGE NATIONAL FOREST.

Landscape	Marten	Fisher	Lynx	Wolverine
Big Hole	Known	Suspected	Known	Known
Boulder River	Suspected	Unknown	Suspected	Suspected
Clark Fork-Flints	Known	Suspected	Known	Known
Elkhorns	Known	Unknown	Known	Known
Gravelly Range	Known	Unknown	Known	Known
Jefferson River	Suspected	Unknown	Suspected	Suspected
Lima-Tendoy	Unknown	Unknown	Suspected	Suspected
Madison	Known	Unknown	Known	Known
Pioneers	Known	Known	Known	Known
Rock Creek Subbasin	Known	Suspected	Known	Known
Tobacco Roots	Known	Unknown	Known	Known
Upper Clark Fork	Known	Suspected	Known	Known

## AMERICAN MARTEN

### *Description*

The American marten (hereafter ‘marten’) belongs to the order Carnivora, family Mustelidae, genus *Martes*. Strickland et al. (1982) described the marten as a carnivorous mammal about the size of a small house cat but longer and more slender with a bushy tail and sharp, pointed face. Its total length is between 50 and 68 cm (20-27 in.) and it weighs 0.5-1.4 kg (1-3 lbs.) as an adult depending on sex (males are larger than females), age and geographic location (Strickland et al. 1982, Buskirk and McDonald 1989).



### *Distribution*

The marten is broadly distributed; from spruce-fir (*Picea* spp.-*Abies* spp.) forests of northern New Mexico to the northern limits of trees in Alaska and Canada, and from the southern Sierra Nevada Mountains of California to Newfoundland Island (Hall 1981). In Canada and Alaska, its distribution is vast and continuous, but in the western contiguous United States, its distribution is limited to mountain ranges that provide preferred habitat. Throughout the marten's original southern limits, considerable range loss has occurred due to anthropogenic factors (Strickland et al. 1982). Marten are easily baited and trapped. This has led to over harvest if not extirpation in many settled or readily accessible areas.

### *Habitat*

Martens occupy a narrow range of habitat types, living in or near coniferous forests (Allen 1987). They associate closely with late-successional stands of mesic conifers, especially those with complex physical structure near the ground (Buskirk and Powell 1994). Such structure provides denning, resting, and foraging habitat, thermal and escape cover, and access to subnivalian (below snow) sites. Subnivalian habitat is important for resting and thermoregulation during winter (Buskirk and Ruggiero 1994).

Suitable resting sites during winter are more critical for marten than for fisher because marten are not as efficient as fisher at retaining body heat (Banci 1989). Energy conservation strategies employed by marten during winter include selection of den sites that offer optimal thermoregulatory characteristics and the ability to enter a shallow



torpor (Buskirk et al. 1989). Marten also adjust their foraging bouts to prey activity patterns (D. Wroblewski, USFS, personal communication).

Marten are smaller and better able to hunt under snow than fishers (Banci 1989). Marten may exploit snow depths and conditions that exclude fishers. Krohn et al. (1995, 1997) believe snow depths may separate the two species since marten have greater foot surface area/weight than fishers.

Forested riparian habitats along streams and meadow edges are important foraging habitats for marten though they avoid traveling across large openings (Koehler and Hornocker 1977, Spencer et al. 1983, Jones and Raphael 1991).

### *Diet*

The diet of marten varies by season, year, and geographic area (Strickland et al. 1982, Buskirk and Ruggiero 1994). In summer, the diet includes bird eggs and nestlings, insects, fish, and young mammals. In fall, berries and other fruits become the most important. In winter, voles (*Clethrionomys* spp., *Microtus* spp.), mice (*Peromyscus* spp.), hares (*Lepus* spp.) and squirrels (*Tamiasciurus* spp.) dominate the diet. During winter, marten prey on squirrels in the trees and on other small mammals beneath the snow. In some geographic areas, single prey species are especially important because of their high availability.

### *Reproduction*

Strickland et al. (1982) summarized the reproductive characteristics of marten. Marten usually mate in July or August. The gestation period is 220 to 276 days. Marten

exhibit delayed implantation. The fertilized egg develops to the blastocyst stage in the uterus, then becomes inactive for about 190 to 250 days until implantation occurs and normal development resumes (Hamilton 1943). Jonkel and Weckwerth (1963) determined the time from implantation to parturition was approximately 27 days. Parturition occurs in March and April but is most common in April (Strickland et al. 1982). Marten produce an average of slightly less than 3 young per female. Adult females produce 1 litter per year. Adult size is attained in about 3 months. Sexual maturity in both males and females is not achieved until at least 15 months of age.

#### *Home range and movements*

Minimum home range size is about 2-3 km<sup>2</sup> (~0.77-1 mi<sup>2</sup>) for males and about 1 km<sup>2</sup> (0.38 mi<sup>2</sup>) for females. Reported home range sizes vary widely partly due to the methods used to calculate home range. In Montana, Hawley and Newby (1957) reported 2.4 km<sup>2</sup> for males and 0.7 km<sup>2</sup> for females; Fager (1991) reported 3.8 to 18.3 km<sup>2</sup> for males and 1.8 km<sup>2</sup> for a female; Coffin (1994) later reported 2.0-17.1 km<sup>2</sup> for males and 2.8-9.1 km<sup>2</sup> for females in the same southwest Montana study areas.

Home range size may be affected by habitat quality and food supply. Thompson and Colgan (1987) found that marten home range sizes were inversely related to food supply. Soutiere (1979) attributed larger home ranges to high levels of clear-cutting. Fager (1991) felt that the forest-grassland mosaic of one of his study areas resulted in larger home ranges than in his second, more forested study area.

## *Mortality*

Trapping is the most direct avenue by which humans affect marten populations (Buskirk and Ruggiero 1994:15). The timing of harvest influences the effects of trapping. Early season trapping is more selective to juveniles while late season (winter and spring) trapping removes more adults. Early season trapping also selectively removes more males while trapping after the onset of active gestation shifts toward selective removal of females. Marten are easily trapped and can be over-harvested where trapping pressure is heavy.

Strickland et al. (1982) documented scattered reports of marten being preyed upon by coyote (*Canis latrans*), fisher, red fox (*Vulpes vulpes*), lynx, cougar (*Felis concolor*), eagles (*Aquila chrysaetos*), and great horned owls (*Bubo virginianus*). Intra-specific and inter-specific competition for food is undoubtedly a mortality factor.

## *Local Information*

Fager (1991), Kujala (1993) and Coffin (1994) completed master's theses on marten on the B-D NF. Western Montana College students conducted one undergraduate study of marten habitat selection on the B-D NF at Maverick Mountain Ski Area (Pilcher et al. 1998). Forest Service wildlife biologists routinely detected marten during winter surveys for forest carnivore tracks in 1998-1999 and 1999-2000 near Georgetown Lake and along the Pioneer Mountains Scenic Byway (B. Conard, USFS, personal observation, Forkan and Kujala 1999, Forkan 2000).

Marten are the most widely distributed and best understood of the four forest carnivores on the B-D NF. They occur in at least 11 of the 12 landscapes. We have not

confirmed their persistent presence in the Lima-Tendoy Landscape but D. Wroblewski (USFS, personal communication) reported marten tracks at Antone Peak in the Snowcrest Mountains at the south end of the Forest. This location is very similar to the habitats of the Lima-Tendoy Landscape.

Fager (1991), Kujala (1993) and Coffin (1994) found that marten on the B-D NF used drier habitats than reported in other literature. Specifically, marten are found in vast lodgepole pine (*Pinus contorta*) forests and in mixed Douglas-fir (*Pseudotsuga menziesii*)/ lodgepole forests. Fager (1991), Kujala (1993), and Coffin (1994) also documented larger home ranges for marten here than reported in other literature (perhaps related to habitat quality).

Montana classifies the marten as a furbearer subject to regulated trapping. The B-D NF falls within Montana Trapping District 2 and 3 (FWP 2000). According to the Montana Trapping Regulations for 2000-2001 (FWP 2000), marten may be trapped from December 1 – February 15, with no limits or quotas on marten. Reporting requirements: Trappers/hunters must provide harvest registration data for marten at the time the pelt is presented for tagging. Pelts must be tagged by Fish, Wildlife, and Parks (FWP) personnel residing in the trapping district where the animal was taken no later than 10 days after the close of the season. Skulls of marten must be turned in to FWP.

The B-D NF and FWP have not coordinated closely enough for the B-D NF biologists to know relative trapping pressures across the forest or the results and interpretations of harvest data collected by FWP. This lack of communication is mainly due to the clear separation of responsibilities rather than poor interagency relations.

Nevertheless, it may now be more appropriate than ever for the agencies to exchange more information regarding these species.

## FISHER

Heinemeyer and Jones (1994) conducted a thorough literature review and developed an adaptive management strategy for fisher. Their publication is an outstanding reference for Forest Service district biologists needing fisher habitat analysis guidelines. Powell and Zielinski (1994) released similar information in the broader forest carnivore conservation assessment (Ruggiero et al. 1994). Thus, I did not duplicate those efforts here but summarized heavily from those sources.

### *Description*

The fisher belongs to the order Carnivora, family Mustelidae and shares the genus *Martes* with the marten. Fishers are similar in body form to weasels, and are the largest elongated terrestrial mustelid, as well as the most sexually dimorphic. Adult males generally weigh between 3-6 kg (~7-13 lbs.) and are 90-120 cm (~35-47 in.) long while females weigh about 1.5-2.5 kg and are 75-95 cm long (Heinemeyer and Jones 1994, Powell and Zielinski 1994).

### *Distribution*

Heinemeyer and Jones (1994:ii) reported: "Fishers historically occupied much of the forested habitats of Canada and the northern United States. Populations declined in the early twentieth century, probably due to habitat loss from settlement and logging,

over trapping, and predator poisoning. Although many eastern populations have recovered, western populations have remained at low numbers or are absent throughout most of their historic range in California, Oregon, Washington, Idaho, Montana, and British Columbia."

### *Habitat*

Heinemeyer and Jones (1994) observed that descriptions and studies of fisher habitat are biased to habitats in eastern North America. According to a limited number of studies conducted in the West, fishers use conifer-dominated forests containing a diversity of habitat types and successional stages (Heinemeyer and Jones 1994). "Fishers are closely associated with forested riparian areas which are used extensively for foraging, resting, and as travel corridors." Fishers prefer mature and old-growth coniferous forest stands, but they also use earlier successional stages. "Fishers prefer forests with continuous cover, though some use of shrubby clearings can occur during certain seasons." "Potential barriers to dispersal include large rivers, mountain divides above timberline, and open-canopied habitats."

Fishers are more selective of resting habitat than for foraging habitat (Buskirk 1991) but they still appear opportunistic in their use of resting sites, with hollow logs, tree cavities and canopies, snags, rocks, ground burrows, and brush piles frequently used (Heinemeyer and Jones 1994:18). Fishers commonly use clumps of stems caused by tree disease (a.k.a. 'Witches brooms') in the canopy of large diameter trees (Jones 1991).

Natal dens are most often in cavities of live or dead trees though hollow logs and rock substrate may also be used (Heinemeyer and Jones 1994:19).

Fishers use lower elevations than marten and are better adapted to earlier successional stages of forests than marten (Banci 1989). Fisher may use lower elevations because marten are better adapted to exploit deeper snow conditions (Krohn et al. 1995, 1997).

### *Diet*

“Fishers probably select prey based on availability” (Heinemeyer and Jones 1994:7). Western fisher diets include snowshoe hare, ungulate carrion, sciurids, voles and birds (Banci 1989, Jones 1991, Roy 1991, Aune and Schladweiler 1993). Prey presence and abundance may partially dictate habitat use of fishers. They may compete with coyotes, fox, bobcats (*Lynx rufus*), lynx, marten, wolverines and raptors for snowshoe hare.

### *Reproduction*

Female fishers have 1 litter per year. The fisher exhibits long-term (327-358 days) delayed implantation with an active gestation of 30 to 35 days. Females may breed at 1 year of age, and have their first litter at 2 years of age (Heinemeyer and Jones 1994). Aune and Schladweiler (1993) reported females did not produce litters until 3 years of age and apparently have very low reproductive potential. Reported litter sizes are small, usually ranging from 1-4 kits with 2-3 kits being the norm (Heinemeyer and Jones 1994:5).

Heinemeyer and Jones (1994) summarized that most documented parturition dates in wild fishers are from mid-March into early April. Parturition occurs February through

May and breeding occurs late in February to late April. The denning period lasts 8-12 weeks. Female fisher may use multiple den sites while raising kits. Kits achieve independence at 16-20 weeks of age, and disperse in the late summer and early winter. Breeding occurs from 2-3 days (Laberee 1941) to 3-9 days (Hodgson 1937) after parturition. Breeding dates on fur farms were 26 March - 23 April in Ontario and 5 April - 27 April in British Columbia (Hall 1942).

Ovulation rates, frequently reported as 73-100%, may over-estimate actual fecundity; recent studies have shown denning rates to be between 34% (Arthur and Krohn 1991) to 54% (Paragi 1990). Reproductive success may be dependent on the physical condition of the females during the winter. The reproductive potential of fishers in western habitats may be lower than that in eastern populations.

#### *Home range & movements*

Heinemeyer and Jones (1994:iii) reported that “[m]ales typically maintain larger home ranges, which typically encompass one or more smaller female home ranges. Home range estimates have ranged from averages of 2.7 to 40.8 km<sup>2</sup> [~1-16 mi<sup>2</sup>] for females and averages of 15.0 to 85.2 km<sup>2</sup> for males. Fishers in the northern Rocky Mountains appear to maintain larger home ranges than those of fishers in eastern habitats, possibly due to a lower productivity of western habitats. Generally, females demonstrate temporal stability in home-range size, whereas males temporarily abandon their home ranges during breeding season in search of females.”

“Fishers are active both day and night, with some tendency for increased activity during crepuscular hours. A shifting of activity in response to environmental conditions,



such as snow conditions or prey availability may occur. Inactivity after large meals or during extreme weather has been noted.” “Fishers are capable of traveling relatively long distances in short periods (64 km [~40 mi] in three days, deVos 1951). Males in particular make long distance movements during the breeding season. Some of the longest reported distances moved by fishers have been from translocated individuals” [over 100 km (~62 mi) for males (Weckwerth and Wright 1966, Roy 1991)].

### *Mortality*

Few known natural causes of fisher mortality exist and no evidence that other animals (except humans) prey extensively on fishers. Strickland et al. (1982) and Powell and Zielinski (1994) reported documented cases of fisher choking on food, being debilitated by porcupine quills, and suffering from mange and distemper. Translocated fishers appear to experience higher rates of predation by coyotes, domestic dogs, large raptors, and mountain lions (Heinemeyer and Jones 1994, Powell and Zielinski 1994).

Trapping has been one of the two most important factors influencing fisher populations (Powell and Zielinski 1994). They are easily trapped and are frequently caught in sets for other furbearers (Heinemeyer and Jones 1994:11). Trapping may affect local populations. Western fisher populations have lower natality and higher natural mortality rates than eastern populations, consequently, western populations may be more susceptible to over-trapping. Incidental captures may limit population growth in some areas.

### *Local Information*

No systematic studies of fishers have been conducted on the B-D NF. Fishers are the least understood of the forest carnivores on the B-D NF, having been documented in only 6 of the 12 landscapes: Pioneers, Rock Creek Sub-basin, Madison Range, Clark Fork-Flints, Big Hole, and Upper Clark Fork.

Local habitat associations are anecdotal. Of the few studies conducted in the western United States, all have been in considerably moister habitat types, such as Grand-fir (*Abies grandis*)/Hemlock (*Tsuga heterophylla*) (Roy 1991, Heinemeyer 1993). The B-D NF does not support such habitat types. The detections here have occurred near spruce (*Picea engelmannii*)/subalpine fir (*Abies lasiocarpa*) habitat types, which are relatively moist forest habitats. Of the habitats available for fisher here, this is not surprising (relative to what is reported in the literature as “preferred habitat”). Still, we should be extremely cautious of deciding what is or is not fisher habitat on the B-D NF until more is learned.

Montana classifies the fisher as a furbearer subject to regulated trapping. The B-D NF falls within Montana Trapping District 2 and 3. According to the Montana Trapping Regulations for 2000-2001 (MFWP 2000), fisher may be trapped from December 1 – February 15. Persons may only possess 1 fisher per season. Trapping District 2 has a quota of 5 fishers. District 3’s quota falls under the statewide quota of 7 fishers. The season closes when the quota is reached or February 15, whichever occurs first. Trappers/hunters must personally report their harvest within 24 hours. They must also provide harvest registration data for fisher at the time the pelt is presented for tagging. Pelts must be tagged by FWP personnel residing in the trapping district where

the animal was taken no later than 5 days after harvest. The entire, intact carcass and skull of fisher must be turned in to FWP.

As mentioned in the marten section, the B-D NF and FWP should coordinate more closely on these species. We have much to learn in terms of relative trapping pressures across the forest and the results and interpretations of harvest data collected by FWP.

## LYNX

The Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) and the “Lynx Science Report” (Ruggiero et al. 2000a) provide state-of-the-art references on lynx ecology and management. Both documents were widely distributed to Forest Service biologists and are available on-line. The federal listing of the lynx as ‘threatened’ will require Forest Service biologists to use these documents routinely as we participate in interagency consultation. To briefly make some of that information available here, I condensed and arranged the following from Ruediger et al. (2000), particularly when it related to Montana:

### *Description*

“Canada lynx are medium-sized cats, 75-90 cm long (30-35 inches) and weighing 8-10.5 kg (18-23 pounds) (Quinn and Parker 1987). They have large feet adapted to walking on snow, long legs, tufts on the ears, and black-tipped tails.”

### *Distribution*

“Their historical range extends from Alaska across much of Canada (except for coastal forests), with southern extensions into parts of the western

United States, the Great Lakes states, and New England (McCord and Cardoza 1982)."

### *Habitat*

"Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare (Ruggiero et al. 2000b). In North America, the distribution of lynx is nearly coincident with that of snowshoe hares (McCord and Cardoza 1982, Bittner and Rongstad 1982)." "Lynx seem to prefer to move through continuous forest, and frequently use ridges, saddles, and riparian areas (Koehler 1990, Staples 1995). Although cover is important to lynx when searching for food (Brand et al. 1976), lynx often hunt along edges (Mowat et al. 2000)."

"Large woody debris (usually logs or root wads) appears to be the common component of natal den sites (Koehler 1990, Mowat et al. 2000, Squires and Laurion 2000). "For denning habitat to be functional, it must be in or adjacent to foraging habitat."

### *Diet*

"Snowshoe hares are the primary prey of lynx, comprising 35-97% of the diet throughout the range of the lynx (Koehler and Aubry 1994). Other prey species include red squirrel (*Tamiasciurus hudsonicus*), grouse (*Bonasa umbellus*, *Dendragapus* spp., *Lagopus* spp.), flying squirrel (*Glaucomys sabrinus*), ground squirrel (*Spermophilus parryii*, *S. richardsonii*), porcupine (*Erethizon dorsatum*), beaver (*Castor canadensis*), mice (*Peromyscus* spp.), voles (*Microtus* spp.), shrews (*Sorex* spp.), fish, and ungulates as carrion or occasionally as prey (Saunders 1963a, van Zyll de Jong 1966, Nellis et al. 1972, Brand et al. 1976, Brand and Keith 1979, Koehler 1990, Staples 1995, O'Donoghue et al. 1998)."

### *Reproduction*

"Breeding occurs through March and April in the north (Quinn and Parker 1987). Kittens are born in May to June in southcentral Yukon (Slough and Mowat 1996). The male lynx does not help with rearing young (Eisenberg 1986). Slough and Mowat (1996) reported yearling females giving birth during periods when hares were abundant; male lynx may be incapable of breeding during their first year (McCord and Cardoza 1982)."

"In Montana, Squires and Laurion (2000) reported that one marked female produced two kittens in 1998. In 1999, two of three females produced litters of two kittens each. In Wyoming (Squires and Laurion 2000), one female produced four kittens in 1998, but snow tracking indicated that the kittens were not with the female in November and presumed dead. The same female produced two kittens in 1999."

### *Home Range and Movements*

“In northcentral Washington, Koehler (1990) reported average home range sizes to be 39 km<sup>2</sup> (15 mi<sup>2</sup>) for two females and 69 km<sup>2</sup> (27 mi<sup>2</sup>) for five males.” “Apps (2000) in southern British Columbia found much larger home ranges of 381 and 239 km<sup>2</sup> (147 and 92 mi<sup>2</sup>) for males and females, respectively.” “In Montana, 4 female home ranges averaged 43 km<sup>2</sup> (17 mi<sup>2</sup>) (Koehler et al. 1979). Generally, home range sizes at the southern extent of lynx range in boreal and montane forests are larger than those reported from the taiga during snowshoe hare peaks (Aubry et al. 2000).”

“Daily movement distances vary. Ward and Krebs (1985) documented an increase in daily cruising radius from 2.7 km (1.6 miles) during moderate to high hare densities, to 5.4 km (3.2 miles) during low hare densities (<0.5 hares/ha or <0.2 hares/acre).” “Ongoing studies in Montana, Wyoming, and southern British Columbia have documented exploratory movements by resident lynx during the summer months (Apps 2000, Squires and Laurion 2000). Distances of exploratory movements in Montana ranged from about 15 km (9 miles) to 40 km (25 miles), and duration away from the home range was 1 week to several months (Squires and Laurion 2000).”

“Many of the lynx habitats in the Rocky Mountains occur as islands of coniferous forest surrounded by shrub-steppe habitats. Movement of lynx between these forested habitats is poorly understood. Lynx have been documented in shrub-steppe habitats adjacent to western boreal forests (within approximately 40 km or 25 miles) during a peak in the jackrabbit population (Lewis and Wenger 1998).”

### *Behavioral Response to Humans*

“Staples (1995) described lynx as being generally tolerant of humans. Other anecdotal reports also suggest that lynx are not displaced by human presence, including moderate levels of snowmobile traffic (Mowat et al. 2000, J. Squires pers. comm. 1999, G. Byrne pers. comm. 1999) and ski area activities (Roe et al. 1999).”

“In a lightly roaded study area in northcentral Washington, logging roads did not appear to affect habitat use by lynx (McKelvey et al. 2000c). In contrast, 6 lynx in the southern Canadian Rocky Mountains crossed highways within their home ranges less than would be expected (Apps 2000). The latter study area contained industrial road networks, twin-tracked railway, and 2 to 4-lane highways with average daily traffic volumes of about 1,000 to 8,000 vehicles per day.”

## *Mortality*

“Reported causes of lynx mortality vary between studies. The most commonly reported causes include starvation of kittens (Quinn and Parker 1987, Koehler 1990), and human-caused mortality, mostly fur trapping (Ward and Krebs 1985, Bailey et al. 1986).” “Paved roads have been a mortality factor in lynx translocation efforts within historical lynx range (Brocke et al. 1990). Other than translocated animals, there have been two documented occurrences of highway mortality, in Wisconsin (Theil 1987) and Minnesota (Don Carlos, unpubl. report 1997). Twelve resident lynx were documented being killed on highways in Canada and Alaska (Staples 1995, Gibeau and Heur 1996, T. Clevenger pers. comm. 1999, Alexander pers. comm. 1999).”

“Predation on lynx by mountain lion, coyote, wolverine, gray wolf, and other lynx has been confirmed (Berrie 1974, Koehler et al. 1979, Poole 1994, Slough and Mowat 1996, O'Donoghue et al. 1997, Apps 2000, Squires and Laurion 2000).”

## *Local Information*

No research or formal studies of lynx have taken place on the B-D NF. However, the B-D NF conducted various detection efforts including the National Lynx Detection Protocol (McKelvey et al. 1999) and systematic snow tracking surveys (Forkan and Kujala 1999, Forkan 2000). In Autumn 2000, the USDA-FS Rocky Mountain Research Station began studying fundamental habitat use and movements of lynx in the Pioneer Mountains.

Lynx have been detected in each of the 12 landscapes comprising the B-D NF, though very few records exist in the southern landscapes. We do not know if all landscapes hold a resident population or if southern detections were of dispersing individuals. The B-D NF appears to be at the periphery of the geographic range of lynx. The most numerous accounts are on the portion of the Forest west of the Continental Divide. These coincide with relatively moist and more expansive cover types found

there. At the other extreme is the Lima-Tendoy Landscape, with only about four detections (FWP 1998).

Montana classifies the lynx as a furbearer with a closed trapping season. Accidentally trapped lynx that *cannot be released uninjured* (emphasis added) must be immediately reported to FWP (MFWP 2000). It might be helpful if trappers reported all incidentally trapped lynx, regardless of injuries, in order to contribute to distribution information. Such information could at least be *asked* of trappers in a manner similar to voluntary mail-in surveys for waterfowl harvests or fishing days.

## WOLVERINE

### *Description*

The wolverine is the largest-bodied terrestrial mustelid (Banci 1994:99). Its head is broad and rounded, with small eyes and short, rounded ears. The legs are short, with five toes on each foot. The claws are curved and semi-retractile and are used for digging and climbing. Typical weights for adult males are 12-18 kg (~26-40 lbs.) and for adult females 8-12 kg (~18-26 lbs.). The coat is typically a rich, glossy, dark brown. Two pale buff stripes sweep from the nape of the neck along the flanks to the base of the long, bushy tail. White or orange patches are common on the chest.

### *Distribution*

The historical North American distribution of the wolverine included the northern part of the continent southward to the northernmost tier of the United States from Maine to Washington State, and extending south into Arizona and New Mexico (Hash 1987).

In the western U.S., wolverine distribution is a peninsular extension of Canadian populations within a continuous breeding group from the 38th parallel northward (Hash 1987, Banci 1994)

Wolverine populations in Montana were near extinction by 1920 (Newby and Wright 1955) but numbers increased in the western part of the state from 1950 to 1980 (Hornocker and Hash 1981).

### *Habitat*

Broadly speaking, wolverines are restricted to boreal forests, tundra, and western mountains but are not associated with any particular vegetative community. Habitats used by wolverines appear to vary geographically and seasonally. Preferences for some forest cover types, aspects, slopes, or elevations have been primarily attributed to a greater abundance of food (Gardner 1985, Banci 1987) or the avoidance of high temperatures and humans (Hornocker and Hash 1981). The current distribution of wolverine coincides with areas of low human occurrence, which represents a substantial reduction from its historic range.

The most specific habitat need of wolverine may be for denning. All authors agree that the use of reproductive dens begins from early February to late March (Copeland 1996). Female wolverines in central Idaho preferred secluded subalpine talus sites in cirque basins for natal and kit rearing dens (Copeland and Harris 1994, Copeland 1996) from which they made foraging trips as far as 15 km (~9 mi.). Sample sizes for these conclusions are very small, so much more investigation is needed. The concave nature of a cirque may enhance longevity of snow depth, thereby insuring integrity of den



structure into late winter. Large boulder talus provide cavities used as natal and nursery dens. Post-weaning rendezvous sites for kits and adult females included large boulder talus and structurally mature spruce/fir riparian sites with dense understory and forest floor debris for security and hiding cover. Such sites were often associated with subalpine rock/scree. Boulder talus was also associated with foraging during both winter and summer months and may be used for thermal cover.

### *Diet*

Wolverines are generally described as opportunistic omnivores in summer and primarily scavengers in winter. All studies have shown the importance of large mammal carrion. Wolverines appear to rely on carrion (ungulate and/or livestock) during winter when other foods are less available.

### *Reproduction*

Wolverines exhibit delayed implantation, during which development of the embryo is arrested at the blastocyst stage. Implantation in the uterine wall can occur as early as November (Banci and Harestad 1988) or as late as March (Rausch and Pearson 1972), birth *can* therefore occur as early as January or as late as April (Banci and Harestad 1988). Parturition in wolverine may correspond to increased amount of ungulate carrion in late winter.

Wolverines have low reproductive potential. Females do not breed their first summer (when 15-18 months of age) (Banci 1994). Most males are sexually immature until 2+ years of age (Rausch and Pearson 1972, Banci and Harestad 1988). In Montana,

only 50% of adult females were thought to be pregnant in any year of a 5-year study (Hornocker and Hash 1981). Litter sizes as large as 6 in captive animals (Rausch and Pearson 1972) and 4 in wild ones have been reported but litter size after den abandonment is typically fewer than 3 (Pulliainen 1968, Magoun 1985). Older females seem capable of producing larger litters, but fewer females in these older age classes may produce litters (Banci 1994).

#### *Home range and movements*

The spatial requirements of wolverine may be as large as for any mammal in North America. Home ranges of wolverine in Idaho ranged from 80 to 700 km<sup>2</sup> (~31-270 mi<sup>2</sup>) for females and over 2,000 km<sup>2</sup> (772 mi<sup>2</sup>) for males (Copeland and Harris 1994). Wolverine occurrence is most likely keyed to food availability (Garner 1985, Whitman et al. 1986, Banci 1987) and availability of den sites.

#### *Mortality*

Banci (1994) summarized mortality factors for wolverine. They have few natural predators but are occasionally attacked and killed, but seldom eaten, by wolves and other large carnivores. Starvation likely is an important mortality factor for young and very old wolverines. Over most of its distribution, the primary mortality factor is trapping and hunting. In several telemetry studies, trapping accounted for over half of all mortalities. Lacking more information, little can be said of the additive or compensatory nature of trapping mortality. Banci (1994) believed that harvests of juvenile wolverine, especially early in the season, may be compensatory because of their suspected high natural

mortality. Some harvest of adults, specifically those that are nutritionally stressed, may also be compensatory. In general, the harvest of most adults may be additive to natural mortality.

### *Local Information*

No systematic local studies of wolverine have occurred on the B-D NF. In the winter of 1999-2000, Wisdom/Wise River Ranger District staff deployed remote 'Manley'-type cameras to survey for wolverine in the west Big Hole and Pioneer landscapes (T. Kombrec, USFS, personal communication). The effort netted one photo event of a wolverine in the west Big Hole. Wolverine tracks were also detected during camera maintenance trips.

Over time, wolverines have been documented in all 12 landscapes of the B-D. A few incidental wolverine sightings exist in the records of each ranger district making up the B-D NF (see information management recommendations for comments).

One of the first records of wolverine in present day Montana may have been by Meriwether Lewis, along Trail Creek about 7.2 km (4.5 mi) east of Lemhi Pass. The journal of Lewis contains a sighting of an unidentified animal (later thought to be a wolverine by some) on Monday, August 12, 1805 (Moulton 1988:74). Lewis was following an Indian road up present day Trail Creek toward Lemhi Pass. He describes a 'narrows' that matches a location just east of the present day 'Selway Ranch' (as it is labeled on 1996 Forest Service travel plan maps). The legal description is centered on the corners of sections 17, 18, 19 & 20, Township 10 South, Range 14 West. Lewis wrote of the encounter:

*“The road was still plain, I therefore did not despair in shortly finding a passage over the mountains and of taisting the waters of the great Columbia this evening. we saw an animal which we took to be of the fox kind as large or reather larger than the small wolf of the plains. it’s colours were a curious mixture of black, redis-brown and yellow. Drewyer shot at him about 130 yards and knocked him dow bet he recovered and got out of our reach. it is certainly a different animal from any that we have yet seen.”*

Lewis’ failure to note the distinctive side band makes the sighting questionable (Burroughs 1995) but the ‘[reddish]-brown and yellow’ observations could certainly be referring to the side bands when observed at a distance 119 m (about 130 yards). Incidentally, Burroughs (1995) found no observations of fisher in present day Montana by the Lewis and Clark expedition and no evidence the expedition observed or collected living specimens of marten or lynx from present day Montana. However, the expedition obtained pelts of both marten and lynx from the Indians at Fort Mandan in present day North Dakota (Burroughs 1995).

The few local wolverine records we have are in habitats consistent with habitat descriptions in the literature. The B-D NF supports a large amount of high elevation, wilderness-like habitat.

Montana classifies the wolverine as a furbearer subject to regulated trapping. The B-D NF falls within Montana Trapping District 2 and 3. According to the Montana Trapping Regulations for 2000-2001 (MFWP 2000), wolverine may be trapped from December 1 – February 15. Persons may take and possess 1 wolverine per season but no quotas. Trappers/hunters must provide harvest registration data for wolverine at the time the pelt is presented for tagging. Pelts must be tagged by FWP personnel residing in the

trapping district where the animal was taken no later than 5 days after harvest. The entire, intact carcass and skull of wolverine must be turned in to FWP.

As mentioned earlier, the B-D NF should coordinate more closely with FWP to better understand relative trapping pressures across the forest and the results and interpretations of harvest data collected by FWP.

## LANDSCAPE ASSESSMENTS

As part of forest planning and in preparation for revision of the Forest Plan, the B-D NF was divided into 12 subunits (a.k.a. 'Landscapes' or 'Ecosystems') (Fig. 1). Broad-scale assessments of resource conditions have been completed or are planned for each of these subunits. Of the 12 landscapes, 7 assessments are complete, 4 are underway and 1 has not begun (Table 1). They have alternately been called 'Landscape Assessments,' 'Watershed Assessments' or 'Sub-basin Assessments.' These assessments are an inventory of current resources and features, an attempt to describe past conditions (including a description of the 'natural range of variation') and a description of the 'desired future conditions.' Ultimately, these assessments recommend changes to the Forest Plan and identify potential areas for management action.

I summarized the key findings of the landscapes as they relate to forest carnivores, including occurrence reports and habitat factors (e.g., vegetation conditions, fire ecology). Whenever possible, I identified specific areas of landscape linkages (though these are not always within Forest Service jurisdiction). For incomplete assessments, I discussed a few anecdotal features related to forest carnivores but essentially point out that information is lacking in these areas.

## TOBACCO ROOT MOUNTAINS LANDSCAPE ASSESSMENT

Unless otherwise cited, all conclusions are directly from the Tobacco Roots Landscape Assessment (TRLA 1994). In some cases, I provided specific page numbers to direct the reader to important parts of the landscape assessment.

### *Forest Carnivore Findings*

We know little about the forest carnivores in the Tobacco Root Mountains (TRLA 1994: VII-35-41). The TRLA (1994) reported pine marten have been sighted in the “area” but no specific information was given. To the contrary, Gibilisco (1994:11-12) reported that the Tobacco Root Mountains have lost an historically present marten population. Suitable habitat for lynx and fisher exists but no specific records were revealed in the TRLA. Wolverines may be residents of the area but otherwise no specifics were given. R. Wiseman (USFS, personal communication) subsequently reported that marten, lynx and wolverine are present in the mountain range as evidenced by trapping (in the case of marten) and tracks (for all). Gray wolves (*Canis lupus*) and grizzly bears (*Ursus arctos*) appear to be at least transient to the Tobacco Roots; this may be relevant in considering carnivore immigration or emigration potential.

Historically, no forested link between the Tobacco Root Mountains and the adjacent Gravelly or Madison Mountain Ranges was present. However, a band of foothill ridges at Virginia City Hill link to the Gravelly Range. Likewise at Norris Hill a link to the Madison Range may serve as a travel corridor for some larger species.

The TRLA (1994) did not recommend any forest carnivore amendments or adjustments to the Forest Plan. However, one observation was that the Plan does not have any standards for recreation use as it affects wildlife (TRLA 1994: VII-41).

### *Habitat Factors Affecting Forest Carnivores*

The Tobacco Root Mountains are comprised of 4 major habitat zones: the dry foothills, the interior forests, the alpine zone, and the riparian/valley bottoms. Each has changed dramatically from historic conditions.

Dry foothills, covering ~8,908 hectares (22,012 acres), represent the transition zone between continuous grassland and continuous interior coniferous forest. Fire shaped the composition and structure in this zone but is now effectively excluded. Historically, grass and sagebrush (*Artemisia* spp.) cover types averaged over 80% of the acres but currently occupy about 24%. Douglas-fir increased from less than 10% of the acres historically to over 40%. Aspen (*Populus tremuloides*) stands occupy only 30% of their historic acreage.

Interior conifer forests, covering 17,395 hectares (42,983 acres), are composed of Douglas-fir, lodgepole pine and some spruce, subalpine fir and whitebark pine (*Pinus albicaulis*). These forests occur in the mid-elevations (2,133-2,438 m or 7,000-8,000 ft) around the core of the Tobacco Root Mountains. Because of effective fire suppression, a much higher component of mature and old growth stands exist than did historically.

The alpine vegetation zone, covering 20,035 hectares (49,507 acres), is characterized by whitebark pine stands (55%), alpine grasslands/tundra (23%) and subalpine fir (4%). The species composition of the zone is similar to historic conditions

but more seedlings and sapling stands probably occur now due to encroachment on alpine grass sites resulting from effective fire exclusion.

Riparian Valley Bottom made up 1,820 hectares (4,497 acres) associated with perennial streams and high water tables. This zone is recognized as important habitat and corridors for nearly all the animals found in the landscape. However, conditions have changed dramatically from that which occurred historically. Contributing factors that have caused the change include mining, road building, livestock grazing, fire suppression, recreation, beaver removal, and introduced species.

Recreation effects on forest carnivores are still poorly understood but the issue is of increasing concern. The Tobacco Root Mountains provide a spectrum of recreation opportunity. The Forest Plan greatly underestimated the demand for recreation consequently the area is experiencing unforeseen effects on resources and conflicts between user groups (TRLA 1994).

Road effects on forest carnivores are also poorly understood. Roads provide access to trappers and thereby increase the vulnerability of forest carnivores to mortality. The landscape supports a widespread system of roads developed for timber harvest and mining access. Open road densities range from 0.26 – 1.34 mi/mi<sup>2</sup>. During the period of December 1 – April 1, road densities are of little meaning because most of the Tobacco Roots are open to snowmobiles. Only topography, available snow, and rider experience/machine capability limit snowmobile travel.

Timber harvest is a management action that can dramatically alter forest carnivore habitat. Timber harvest has reportedly been taking place in the Tobacco Roots since shortly after the 1863 discovery of gold. No accurate records exist of where and how



much timber was harvested from then until the early 1960's. Since then, Forest Service timber stand records indicate that approximately 2,500 acres of primarily lodgepole pine have been harvested. The 1986 Beaverhead Forest Plan allocated 19,000 acres (77 km<sup>2</sup>) suitable for timber management (out of 114,000 acres, or 461 km<sup>2</sup>) of NFS lands in the area). Approximately 1,800 of these acres lie in roadless area designation.

## MADISON RANGE LANDSCAPE ASSESSMENT

Resource specialists from both the Beaverhead and Gallatin National Forests completed the Madison Range Landscape Assessment in 1995. Unless specifically cited, the following conclusions are directly from the assessment (MRLA 1995). In some cases, I provided specific page numbers to direct the reader to important parts of the landscape assessment.

### *Forest Carnivore Findings*

“The Madison Range provides critical or unique habitat for several wildlife species of regional significance: grizzly bear [*Ursus arctos*], elk [*Cervus elaphus*], shiras moose [*Alces alces*], wolverine and lynx” (MRLA 1995, Wildlife:1). Of the forest carnivores, the assessment focused on wolverine and lynx. Martens also inhabit the mountain range but fishers apparently do not.

Wolverine - The Madison Range was regionally classified as primary wolverine habitat (MRLA 1995, Wildlife:3). Wolverines occur in the landscape and on the adjacent areas of the Beaverhead NF, Gallatin NF and in Yellowstone National Park. The Madison Range provides extensive ungulate habitat, large blocks of unroaded, forested

areas, and large amounts of mature and old growth forest structure. The high elevation forests provide important natal/maternal denning habitat. Although habitat was described, nothing specific is known about existing populations (MRLA 1995, Wildlife:4-6).

The Forest conducted some habitat analysis and modeling and mapped important habitat components. Timberline cirque areas with large boulders and mature subalpine fir were delineated as potential high quality denning areas (following Copeland, pers. comm. 1995, Western Forest Carnivore Committee 1994). The high-density carrion areas were identified as likely higher quality foraging sites.

The Madison Range consists of three broad areas differing in habitat suitability: The North Zone (a.k.a., Spanish Peaks area) is low in structural diversity preferred by wolverines but contains good quality habitat. High elk numbers and winter range provide a good carrion forage base. Road densities and human activity levels are low. A moderate amount of natal and maternal denning habitat exists. A high amount of designated wilderness and a large, private conservation easement ensure that the remote nature of the area will continue. This zone will provide good wolverine habitat through the foreseeable future. Natural disturbance such as fire would increase the structural diversity of forested stands and would improve the habitat.

The Mid-zone (a.k.a., Big Sky and Jack Creek) contains lower quality habitat than the other two zones. Human developments and timber harvest are impacting this zone. The area has a lower quality forage base for wolverine and limited natal/maternal denning habitat. As cutover areas regenerate, the habitat in this zone will improve. It will be important in this zone to maintain connectivity between the other two zones.

The South Zone (between Taylor/Indian Creek and Hebgen Lake) provides the best wolverine habitat in the landscape. It contains 1) a good distribution of quality den habitat, 2) a good prey base, and 3) low road density and remoteness associated with high quality wolverine habitat. It is important to maintain an ungulate carrion forage base, forested stands with complex down dead components, and low level of human use in alpine areas, from March through May.

Some specific wolverine habitat guidelines were developed, including:

- Maintain general habitat needs by having a forest structure of >40% mature and >75% older than 50 years in the northern and southern wolverine zones.
- Increase structural diversity of forested stands in the northern zone.
- Provide security habitat by a) maintaining a road density of less than 1 mi/ mi<sup>2</sup>. in each of the northern and southern zones; less than 2 mi/sq. mi. in the mid zone, and b) retaining portions of the north and south zone as remote and inaccessible.
- Maintain delineated higher quality natal/maternal denning habitat in ELU/s 3 and 4 by a) ensuring that 30% of each block is in mature or suitable denning structure; each block to have a mosaic of structure, and b) minimize human use within the block, March through May.
- Manage for a widely distributed, high quality forage base by maintaining the elk migration corridor in Taylor Fork and the current distribution of big game winter ranges, particularly those ringing the southern zone.

Lynx - Little is known about lynx in the Madison Range (MRLA 1995, Wildlife: 6-7). Lynx are likely present but very few observations are recorded. The Forest conducted some habitat modeling but this effort may now be obsolete since a new round of mapping was done following Ruediger et al. (2000). In 1994, the Western Forest Carnivore Committee recognized the Madison Range as regionally important primary

lynx habitat. The MRLA provided some habitat recommendations, but these must now be compared to contemporary guidance of Ruediger et al. (2000).

### *Habitat Factors Affecting Forest Carnivores*

The roughly 560,000 acre (2,266 km<sup>2</sup>) Madison Range Landscape is dominated by forest cover types (72%) and has equal representation of shrub/forb/grassland (14%) and 'non-vegetation' (14%, mostly rock). The forest cover types consist of: lodgepole pine (38%), whitebark pine (21%), Douglas-fir (17%), Spruce/fir (17%), lodgepole/Douglas-fir mix (5%) and "other" (1%).

The assessment revealed some interesting patterns relative to fire ecology and vegetation trends. The specialists analyzed the fire history and fire regime of the landscape and documented, by fire group (Fischer and Clayton 1983), the number and extent of recent fires as compared to estimated historical averages (Table 4).

These fire regimes are rough but reasonable *averages* over time based on the fire ecology of each fire group. Stand replacement fires did not occur in a given year as expressed in these averages. For example, in fire group 6, severe fires happened about every 120 years, with an average of 122 hectares (302 acres) per year; so any one fire event might affect 146 km<sup>2</sup> (36,240 acres), but might happen only once in 120 years.

Prior to 1940, an estimated *average* of 30 km<sup>2</sup> (7,542 acres) burned per year (at low, moderate and high intensities). In contrast, the current average is 33 hectares (81 acres) per year (from 1940-1994, and the advent of effective fire suppression).

The frequency of fire starts for the Madison Range from 1940-1994 was 5 fires per year (3 naturally caused and 2 person caused). We have no way of comparing this to

historical natural starts, nor do we have any way of knowing how many ignitions or how many acres were affected by American Indian use of fire. What is clear is a very dramatic difference between the way fire affected forest communities in historic versus present times.

TABLE 3. COMPARISON OF RECENT FIRE REGIMES WITH HISTORIC FIRE REGIMES IN THE MADISON RANGE LANDSCAPE.

Fire Group	Acres of this fire regime in Madison Landscape	Historical Average Acres Burned/Yr. in Low-Moderate Intensity	Historical Average Acres Burned/Yr. in Stand Replacement Intensity	Historical Total Average Acres Burned/Yr.	Recent Average Acres Burned/Yr. (1940-'94)	Number of Fires Recorded in 54 year period ('40-'94)
Misc.	47,276	2,364	N/a	2,364	13.4	31
Dry limber pine	1,053	14	N/a	14	0	1
Warm, dry DF	7,915	198	66	264	2.4	10
Cool, dry DF	6,766	113	56	169	4.3	9
Moist DF	36,265	604	302	906	1.4	44
Cool LPP	169,404	1,882	941	2,823	49.6	??
Dry, low SAF	46,475	258	258	516	2.7	32
Moist, low SAF	40,404	N/a	162	162	0.7	44
Moist SAF	97,181	N/a	324	324	6.8	47
TOTAL	559,601	5,433 ac./yr.	2,109 ac./yr.	7,542 ac./yr.	81.1 ac./yr.	

The effects of fire suppression are more dramatic on the shorter fire return interval habitats and/or fire cycle habitat types than those with a longer fire period. In grasslands, where replacement fires occurred every 20 years on the average, we have affected the natural fire rotation by not allowing the fire starts to burn freely. In the Douglas-fir group (with a fire return interval of 40 years) and in lodgepole pine (where

FRI is 60 years), we have disrupted the natural fire occurrence cycle once, if not twice (having effectively suppressed fires for over 50 years). This interruption in fire return interval has led to expansion of conifers into previously open spaces, accumulations of fuel, and homogenization of forest age classes across broad areas of the landscape. We have only begun to affect habitat types such as subalpine fir, spruce and whitebark pine, with fire cycles of 200 years or more.

Specialists also analyzed current forest structure in 4 vegetation zones and estimated the past distribution and abundance at 150 years before 1995 (the time of the assessment). Most of the forest carnivore habitat occurs in 2 of the zones: the lower, drier lodgepole pine/subalpine fir habitat and the higher, moister lodgepole pine/subalpine fir habitats.

The lower lodgepole pine and subalpine fir fire habitat types had FRI's around 120-180 years. In 1845, the forests in this zone were 52% mature and 48% immature (Table 5). By 1995, this ratio had shifted to 77% mature and 23% immature. Not only has the percent age class composition changed, but also the forest has expanded from 68% to 83% of the land area in the zone (in spite of timber management). Land use decisions will have great implications for forest carnivore management here because this zone supports more suitable habitat than other zones.

TABLE 4. COMPARISON OF FOREST STRUCTURE AND EXTENT IN LOWER LODGEPOLE PINE/SUBALPINE FIR ZONE OF THE MADISON RANGE BETWEEN 1845 AND 1995.

	Year 1845	Percent of Forest Structure	Year 1995	Percent of Forest Structure
Mature Forest	36,123 acres	52%	64,772 acres	77%
Immature Forest	32,748 acres	48%	19,503 acres	23%
Total forest acres (% of area forested)	68,871 (68% of zone)		84,275 (83% of ELU)	

The cooler, wetter lodgepole pine/ subalpine fir zone is ‘classic’ forest carnivore habitat. There has been a dramatic shift in age class composition but virtually no increase in total distribution of these forests (Table 5).

TABLE 5. COMPARISON OF FOREST STRUCTURE AND EXTENT IN HIGH ELEVATION LODGEPOLE PINE/ SUBALPINE FIR ZONE OF THE MADISON RANGE BETWEEN 1845 AND 1995.

	Year 1845	Percent of Forest Structure	Year 1995	Percent of Forest Structure
Mature Forest	52,752 acres	37%	119,707 acres	85%
Immature Forest	88,264 acres	63%	21,479 acres	15%
Total forested acres and % of ELU forested.	141,016 (79% of zone)		141,187 (79% of ELU)	

In the absence of fire disturbance, insects and disease have become a major force in shaping the structure and composition of the forested communities. To an extent, insect and disease agents improve habitat conditions for forest carnivores at the stand level by creating feeding, resting, and breeding habitat (structural complexity). Mature forests are the foundation of forest carnivore habitat. However, the landscape-level effects of fire suppression, resulting in potentially ‘un-natural’ fire regimes, are a major consideration in forest carnivore management that has been largely overlooked.

## PIONEER MOUNTAINS LANDSCAPE ASSESSMENT

The Pioneer Mountain Landscape Assessment (PMLA) was completed in August 1998. Unless otherwise cited, the following conclusions are directly from the assessment. In some cases, I provided specific page numbers to direct the reader to important parts of the landscape assessment.

### *Forest Carnivore Findings*

Lynx, marten, fisher and wolverine are present in the Pioneer Mountains, but the landscape assessment treated them in a rather encyclopedic manner. The assessment provided a brief literature review for the species but offered little site-specific information. Marten are relatively common and were not discussed in detail in the assessment.

Lynx occur in the Pioneer Mountains (PMLA 1998). Subsequent to release of the PMLA, lynx presence has been re-confirmed (Forkan and Kujala 1999, Forkan 2000). In Autumn 2000, the Rocky Mountain Research Station began lynx research in the Pioneer Mountains to better understand lynx habitat use and movements.

Wolverines occur in the Pioneer Mountains (PMLA 1998). The Pioneer Mountains were designated as primary wolverine habitat in the Draft Wolverine Conservation Strategy then being prepared by the Western Forest Carnivore Committee.

Fishers are locally the least understood of the forest carnivores. Trapping records did not list fisher within the Pioneer landscape (PMLA 1998). However, the assessment reported at least 1 confirmed set of tracks in the north Pioneers from FWP survey efforts. Giddings and Squires (1998) detected fisher tracks in Steel Creek in the west Pioneers.

### *Habitat Factors Affecting Forest Carnivores*

The Pioneer Mountains are a semi-isolated mountain range. The landscape is nearly surrounded by open sagebrush-grassland cover types and a system of paved roads. No distinct forested linkage zones to other forested mountain ranges are present. Big



Hole Divide, at the south end of the Pioneers, consists of a ridge with semi-forested features and may provide the best opportunity for linkage.

The landscape supports a diversity of life zones from high rocky peaks to broad grassland valleys. The highest elevations are dominated by rock and alpine vegetation. High to mid-elevation forests are dominated by mature and old-aged lodgepole pine. Whitebark pine is scattered, mostly near timberline. Mixed spruce and subalpine fir are scattered through as habitat type allows (aspect, soil moisture, etc.). Lower forests are a mix of Douglas-fir and lodgepole pine. The lowest elevations of the landscape are grassland-sagebrush mixes and agricultural lands. Aspen is a small component, making up probably less than 1% of the landscape. Willow (*Salix* spp.) and cottonwood (*Populus* spp.) occur in riparian areas, primarily in mid to lower elevations.

Overall, vegetation coverage is similar to what may have existed around the 1860's when settlers arrived. That is, about half the landscape is forested and the other half is a mixture of sagebrush-grassland, willow, aspen, rock, water, and other non-forested types. However, the amount and distribution of certain vegetation types has changed. For example, fewer acres of native grassland-sagebrush exist because of agriculture and development. The higher elevation forests that provide forest carnivore habitat are now dominated by older-aged lodgepole pine stands (roughly, 33% of the whole landscape versus estimates of 4%-12% historically). Young lodgepole pine stands are uncommon.

Young lodgepole pine forests are important for snowshoe hare habitat. Approximately 5% of the landscape or 199 km<sup>2</sup> (49,200 acres) occur in this class, despite lodgepole pine being the most common tree species. Most of these young forests were

created by timber harvest rather than fire events. Logging has affected 3% (45 km<sup>2</sup> or about 11,000 acres) of the lodgepole pine and Douglas-fir inventoried. Many of these regenerating harvest units are close to roads, so important prey habitat for forest carnivores also has relatively easy human access. Prescribed natural fire in roadless areas could contribute additional foraging areas for forest carnivores.

The effects of recreation on forest carnivores are poorly understood, but are an issue of increasing concern. The Pioneer Mountains are highly valued for recreation. The Pioneer Mountain Scenic Byway provides a major route through the core of the Pioneers. Numerous developed recreation sites are located along and adjacent to the byway. The core of the Pioneers is primitive or semi-primitive roadless backcountry. The Forest Plan (1986) officially identified 264,145 acres (1,069 km<sup>2</sup>) as roadless. The Pioneer Mountains are very popular with snowmobilers. In the winter, much of the area that is otherwise impassible or closed to motorized use at other times of year is open and accessible by snowmobile.

## BOULDER RIVER LANDSCAPE ASSESSMENT

The Boulder River Landscape Assessment was completed in 1997. This roughly 931 km<sup>2</sup> (230,000 acre) landscape includes the entire upper end of the Boulder River within Jefferson County. Unless specifically cited, the following conclusions are directly from the assessment (BRLA 1997). In some cases, I provided specific page numbers to direct the reader to important parts of the landscape assessment.

### *Forest Carnivore Findings*

The occurrence of forest carnivores in this landscape is poorly understood. The wildlife portion of the assessment mentions marten, lynx, and wolverine but not fisher. Virtually no specific analysis was completed for these animals other than to recognize certain habitat needs that are represented on the landscape.

Winter ranges may be seasonally important to wolverine. Key winter areas include Pole Mountain/Berkin Flat, Dry Gulch, Little Galena and Amazon areas.

Undeveloped or lightly developed areas such as Cottonwood Lake, Three Brothers and Little Boulder Park provide large blocks of forest habitat. The existing and proposed expansion of the snowmobile trail system needs to be evaluated because it may affect wolverine denning habitat. The wildlife portion of the assessment emphasized game species with one notable exception. Some of the potential wolverine denning habitat was already identified and balanced with recreation goals. The small unroaded area around Cottonwood Lakes and Electric Peak coincided in part with the area most likely to be wolverine denning habitat.

Habitat Corridors and Linkages: The Boulder River landscape is part of a larger mountain complex that lies between the Highlands to the south and the Bob Marshall complex to the north. The landscape is part of the greater Boulder/Lowland/Whitetail mountain complex. Dispersal routes *within* the mountain range include large habitat patches, ridges, and riparian corridors. The Homestake Pass area provides a linkage to the Highlands to the south. The Hadley Park area and the Little Whitetail valley provide dispersal corridors to the Bull Mountains. Important linkages *to other* mountain ranges included Silver Bow Creek, which may have historically allowed movement into the Flint

Creek Range or Anaconda Range to the west. McDonald and Mullan Passes, located to the north, allowed movement towards the Scapegoat/Bob Marshall complex. Boulder Hill provides a linkage to the Elkhorns to the east. Broad valley bottoms separate the Tobacco Roots to the southeast.

Highways and other development have impacted these linkages and dispersal routes. As this development continues, animal movements between ranges will become more difficult and may isolate some species.

The wildlife biologist examined the current Deerlodge Forest Plan for its applicability to wildlife management in the Boulder landscape. Yet, none of the recommendations referred to forest carnivores, perhaps because the intent of the assessment was simply to validate existing Forest Plan guidance, not suggest new guidelines.

#### *Habitat Factors Affecting Forest Carnivores*

Three main issues emerged from the vegetation analysis: First, the lack of frequent, but low intensity fires in the lower elevations (dominated by Douglas-fir) have led to increased tree density and vertical structure. By some estimates, a landscape such as this reportedly may have consisted of 34% to 53% seedling/sapling stands of trees. Current conditions are 6% seedling/sapling, 51% pole sized stands and 26% mature trees (Table 6).

Second, the majority of aspen clones are 80 to 100 years old. Recruitment of younger age classes is lacking. Many of the aspen clones are deteriorating. Because of

fire exclusion, competition with conifers for available light and water has reduced aspen to a minor component in many areas.

Third, even with the amount of regeneration timber harvest (primarily clearcuts) done in the last 25 years, the watershed lacks structural diversity in lodgepole pine cover types. Lodgepole stands are typified by pole-sized trees.

TABLE 6. CURRENT VEGETATION STRUCTURE AND EXTENT IN THE BOULDER RIVER LANDSCAPE.

Landscape Feature	Total Acres	Percent of Landscape
Seedling/sapling (conifer)	13,076	6
Pole sized stands (conifer)	118,909	51
Mature trees (conifer)	61,254	26
Quaking aspen	1,512	1
Dry meadows	30,659	13
Wet meadows/riparian	4,142	2
Rock/talus	2,126	1
Water	82	<1
Permanent clearing	1,201	<1
Total:	232,961	100

Because of the findings, the BRLA prescribes some specific levels of treatment (BRLA 1997). These should be coordinated with the wildlife biologist to ensure compatibility with forest carnivore habitat management guidelines.

The forests of the Subalpine fir zone include lodgepole pine (dominant), Douglas-fir, subalpine fir, spruce and minor amounts of whitebark pine. These forested stands tend to occur in large, continuous blocks of varying size and age classes. This may be the core habitat for forest carnivores. The interior forest has inclusions of small wet meadows and grassy parks. The edges of these small areas offer productive foraging habitat for forest carnivores (wolverine are specifically mentioned in the assessment)

with the security of the adjacent forest. However, human access, disturbance, conifer colonization and livestock grazing have affected many of these areas.

Riparian areas historically provided highly productive habitats and migration corridors for a variety of wildlife species including large predators. In some places, these areas have been altered by removal of beaver, location of roads and crossings, fire suppression, placer and hard rock mining, and livestock grazing.

Aspen and cottonwoods were the primary deciduous species found in the landscape. These provide good resting and denning sites for forest carnivores. Now most of the aspen is in older-aged stands, with interspersed conifers and grassy understories and cottonwoods are in decline.

**Recreation/Travel Management:** Human access, as it may affect forest carnivores, may need a closer look. Wildlife mitigation measures focused on hunting season game security and winter range protection. Currently the landscape does not have many restrictions for snowmobile use (and this may not be an issue but needs a closer look). The Travel Management Guidelines (see Recreation, Desired Future Condition, Guidelines) recognized the need for more assessment on forest carnivores but also presented some guidelines that might conflict with forest carnivore management. For example, providing winter road access to reach snow elevations might also provide an avenue for generalists like coyotes to compete with forest carnivores (Ruediger et al. 2000).

The landscape has only one parcel of land (486 hectares or 1,200 acres) that is closed yearlong to motorized vehicles to provide semi-primitive recreation opportunity and for 'resource protection.' This area is located south of the '4-Corners' and contains

nearly 3 miles (~5 km) of closed road (B-D NF 1996, Deerlodge Forest Area Visitor/Travel Map).

The Continental Divide Scenic Trail currently has motorized and non-motorized objectives. The Continental Divide is consistently identified as an important wildlife dispersal corridor (e.g., see the "Wildlife Connectivity" site on the Interagency Grizzly Bear Committee website: <<http://www.fs.fed.us/r1/wildlife/igbc>>).

## GRAVELLY RANGE LANDSCAPE ASSESSMENT

The Gravelly Landscape includes the Snowcrest Range, Gravelly Range, Centennial Range, and associated valleys. A team of wildlife biologists, including Jim Roscoe (BLM), Bob Brannon (FWP), Ron Wiseman (USFS), and Sue McNeal (USFWS), prepared the wildlife portion of the assessment. Unless specifically cited, the following conclusions are directly from the assessment (GRLA 1999). In some cases, I provided specific page numbers to direct the reader to important parts of the landscape assessment.

### *Forest Carnivore Findings*

Very little is known of fisher, marten, wolverine or lynx in the Gravelly Range. Lynx, wolverine and marten occur as evidenced from anecdotal sightings, trapping records, and some limited systematic survey efforts. Fishers are not known to occur.

Other large carnivores are better understood. To an extent, this may indicate the landscape's potential to support some of the forest carnivores. Grizzly bears are transient. Over 20 sightings and sign of grizzly bears have occurred since 1985 and

reports have been increasing. The Gravelly landscape may contribute to a movement corridor for grizzlies to the Central Idaho and Northern Continental Divide ecosystems. Wolves were only transient in recent years but a pack may have established recently in the western Gravelly Mountain foothills. This is not surprising as wolf populations expand from Yellowstone and central Idaho.

Three major travel corridors or 'linkage zones' for far-ranging species occur. These include 1) Red Rock Pass, 2) the zone between Papoose Creek in the Madison Range and Standard Creek area in the Gravelly Mountains and 3) the Centennial Mountains, which serve as a link across Monida Pass to west. Of those 3 areas, only the Centennial Mountains are managed as a wilderness-like setting.

#### *Habitat Factors Affecting Forest Carnivores*

High elevation forest (the core forest carnivore habitat) is generally in a late seral condition. Structural diversity is greatest in the Snowcrest Mountains and most uniform in the Centennial Mountains. Human influence on this habitat has been minor with the exception of long-term fire control. Inclusions of early seral communities have declined. It would be desirable to provide more early and mid-seral habitat. However, considering political constraints of wilderness study areas, proposed wilderness, and roadless management areas, few opportunities to actively manage forests on a landscape scale are afforded. Wildfire represents the only large-scale influence that could alter forest composition and structure in the near future.

The Mid-Elevation forests have expanded in extent and are generally in late seral conditions. Douglas-fir stands have become relatively unproductive and understory



shrubs and herbaceous plants have declined. The increase in Douglas-fir has also resulted in declines in the extent of upland aspen communities and intermingled stands of sagebrush.

The foothills contain expansive areas of open sagebrush/grassland habitat with only relatively small patches of timbered habitat. The zone is characterized by more diverse land ownership and a greater percentage of private lands.

The valley bottoms are mostly in private ownership and have been significantly altered from historic conditions. More than 60% of existing habitat is converted to agricultural use or residential development. One exception, the extensive wetland habitat in the upper half of the Centennial Valley, mostly occurring on Red Rock Lakes NWR, is a unique feature in the Gravelly landscape. This habitat supports many wetland-dependent species, most notably birds such as the trumpeter swan. A portion of this NWR is managed as Wilderness, a relatively rare situation for valley bottom habitat.

## ROCK CREEK SUB-BASIN REVIEW

The Rock Creek Sub-basin Review was a joint effort between the Lolo and B-D NF, the BLM, FWP, and the USFWS. The sub-basin review tiered its findings to the scientific findings of the much larger Columbia River Basin (CRB) scientific assessment (Quigley et al. 1996). Wildlife biologists on the team represented FWP, the Lolo NF and B-D NF's, BLM, and US FWS. Unless specifically cited, the following conclusions are directly from the assessment (RCSR 1999). In some cases, I provided specific page numbers to direct the reader to important parts of the landscape assessment.

### *Forest Carnivore Findings*

Marten, fisher, lynx, and wolverine are known to occur in the sub-basin, but almost nothing is known about their populations. Thus, the sub-basin review focused on habitat conditions. Fisher habitat was not covered in the sub-basin review. Marten were considered common and were not featured.

Lynx habitat is generally found above 1,524 m (5,000 ft) elevation. Denning habitat and movement opportunities are not limiting for lynx but foraging habitat may be limiting (at least prior to the fires of 2000).

Wolverine - In comparison to historically available habitat, the CRB Science Assessment predicted massive declines for this species. These declines have not occurred in this small portion of the CRB. The sub-basin review found the opposite result. The large amount of roadless/wilderness in the sub-basin, and the lack of well-established ORV activity suggest that wolverines are not at risk. Natal den habitat was mapped for the Lolo portion of the sub-basin. With one exception north of the Welcome Creek Wilderness, none of it was impacted by ORV activity. A similar analysis will be needed for the B-D NF portion of the sub-basin.

### *Habitat Factors Affecting Forest Carnivores*

Winter range was a major concern that emerged from the sub-basin review. In terms of implications to forest carnivores, winter range may be more important to wolverines than to the others. The basin-wide problems of fire exclusion on wintering ungulates are discussed repeatedly in the CRB Science Assessment. However, the sub-basin review found that the impacts on winter range from fire exclusion (and to a lesser

extent noxious weeds) are *more* severe in the Rock Creek sub-basin than what was described in the basin as a whole.

The marten and fisher are old-growth forest associates. The CRB Scientific Assessment predicted adverse impacts on old growth communities from fire exclusion and logging. Risks are rated highest in the low elevation warm/dry zone, but are also rated moderate in the mid and upper elevations. While the sub-basin review validated the concerns for low elevations, it departed significantly from the CRB for old growth at mid and upper elevations. At mid/upper elevations of the Rock Creek Sub-basin, old growth amounts, in-stand structure, and patterns appear to be within the normal ranges. Approximately 50% of the sub-basin is Wilderness, proposed wilderness, or roadless. Only 5% of the sub-basin has had timber harvest but this has been concentrated in a few areas.

On a related topic, the CRB Assessment was concerned with forest fragmentation (resulting from "small patch" timber harvest) as a significant risk to wide-ranging carnivores. Again, the findings for this small portion of the CRB differed from the Science Assessment. The sub-basin as a whole is still well connected and has a large percentage of interior forest. The 5% of the drainage that has been logged in the last 40 years has generally been concentrated in certain areas. In 3 of those areas, (North Rock, Upper Willow, and Ambrose) intensive timber harvest has resulted in local fragmentation; a fourth (the Middle Fork) has some moderate fragmentation.

Security, as it was analyzed here, is more related to game management. The CRB did not deal with security in specific terms but refers to providing refugia for some species. The findings of the sub-basin review was that most of the sub-basin has

adequate wildlife security. A few elk herd-units lack adequate security but security for "refugia-dependent" species such as wolverine appears adequate.

*Post Script* - Until the summer of 2000, there had not been a major large stand replacing fire in the Rock Creek sub-basin for 100 years. The agencies had been very successful at putting out low and mixed severity fires but wildfire risk had been growing. The fires of the 2000 season affected thousands of acres in this sub-basin. The extent of the fires and the ecological implications are being analyzed as of this writing and may change some of the conclusions of the sub-basin report, particularly for the upper elevations of the drainage.

## ELKHORNS LANDSCAPE

The Elkhorns Landscape Assessment was completed by the Helena National Forest in 1993 (J. Bean-Dochstuhl, USFS, personal communication). The area is mostly administered by the Helena National Forest, so the landscape assessment was not reviewed for the purposes of this paper. The B-D NF helps fund and coordinate management. Subsequent analysis (in 1997) was led by the BLM in the south Elkhorns, resulting in a Forest Plan Amendment (J. Bean-Dochstuhl, USFS, personal communication).

J. Canfield (USFS, personal communication) reported that forest carnivores were broadly considered during the landscape assessment but no specific management recommendations were developed. Canfield also reported the following information: Marten, lynx, and wolverine are present in the landscape but fishers are almost certainly not present. Historic trapping records indicate that these carnivores are present at very

low levels and mostly at the higher elevations in 'roadless' portions of the Elkhorn Mountains. Most of the management direction in the landscape has dealt with wildlife on a 'coarse filter' basis including the restoration of habitats (or habitat attributes) that have declined from 'natural conditions.' Some management actions include travel management (motorized restrictions), prescribed fire, livestock utilization standards, aspen revitalization, and limited forest thinning and under burning.

#### LIMA-TENDOYS LANDSCAPE

The Lima-Tendoys Landscape Assessment was partially completed in 1999. Some specialists, including the wildlife biologist, have not completed their input to the assessment due to heavy workloads and conflicting Forest priorities. Some fundamental information was assembled but we have no scheduled completion time.

The Lima-Tendoys landscape is the most open and dissected landscape on the forest. Wolverines are suspected to occur. Marten are unknown. Fishers probably do not occur. Lynx were documented in historic records (FWP 1998).

#### CLARK FORK-FLINTS LANDSCAPE

The Clark Fork-Flints Landscape Assessment was started in 1998 and is partially completed. Marten, fisher, lynx and wolverine probably occur in the landscape but information is drawn from scattered occurrence data. Virtually nothing is known of forest carnivore populations or local habitat associations.

## UPPER CLARK FORK LANDSCAPE

The Upper Clark Fork Landscape Assessment was started in 1999. Marten, fisher, lynx and wolverine probably occur in the landscape but information is drawn from scattered occurrence data. Virtually nothing is known of their populations or local habitat associations.

## WEST BIGHOLE LANDSCAPE

The West Bighole Landscape was started in 1999 but work was interrupted by the fires of 2000, several of which affected this landscape. Marten, fisher, lynx and wolverine are known to occur in the landscape. Information is drawn mainly from scattered occurrence data but the Forest conducted some forest carnivore surveys during which a wolverine was photographed in the west Big Hole (T. Komberec, USFS, personal communication, Wisdom Ranger District files). Three graduate students studied marten in this landscape (Fager 1991, Kujala 1993, Coffin 1994). Otherwise, virtually nothing is known of forest carnivore populations or local habitat associations.

## JEFFERSON RIVER LANDSCAPE

The Jefferson River Landscape Assessment has not been started. The status of the forest carnivores is virtually unknown. Based on adjacent records, marten, lynx and wolverine probably occur but fishers are unlikely to occur.

## **MANAGEMENT OF FOREST CARNIVORES IN FOREST PROGRAMS**

### **REGULATORY FRAMEWORK**

Wildlife management on the national forests has increased in scope and complexity over nearly a century. Wildlife management originally equated to game management. A 1957 wildlife management handbook for Region One of the Forest Service (Anonymous) emphasized three categories of animals: trout, upland game birds and big game. A 1965 wildlife plan for the Lima and Dillon Ranger District considered waterfowl, non-game birds, furbearers and predatory animals (Dillon District files) but ‘furbearers’ did not include lynx, fisher, marten, and wolverine; these were not even mentioned.

Wildlife management began to diversify with the emergence of environmental awareness on behalf of the public. A series of laws and initiatives have helped focus the responsibilities of the Forest Service for wildlife stewardship. The Multiple-Use Sustained-Yield Act of 1960 spelled out the agency’s mission to manage for recreation, range, timber, water, and wildlife in a manner that would not necessarily provide the greatest return or outputs. The passage of the National Environmental Policy Act of 1969 (as amended), Endangered Species Act of 1973, and the National Forest Management Act of 1976 laid the foundation for contemporary wildlife programs in the Forest Service.

## The Forest Plans

The National Forest Management Act and its implementing regulations outlined directions for creation of the first Forest Plans. The regulations also required the Forest Service to "...maintain viable populations of existing native and desired non-native vertebrate species in the planning area..." (36 CFR 219.19). 'Planning area' is defined as the discrete national forests (36 CFR 219.3). A viable population is regarded as one that has the estimated number and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. Forests were simultaneously directed to identify 'management indicator species' (MIS) (36 CFR 219.19 a .1.) to gauge the effects of management activities on populations.

The Beaverhead National Forest Plan was completed in 1986. It contains some broad goals and objectives of maintaining viable populations of all wildlife species. The only mention of forest carnivores is of the marten. The Beaverhead National Forest selected the pine marten as a MIS for old-growth spruce-fir habitat. A forest-wide standard for MIS (pg. II-26, #4) states that:

"Populations of wildlife "indicator species" will be monitored to measure the effect of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desireable [sic] non-native vertebrate species are maintained."

However, no further guidance is provided in the form of specific standards or objectives for habitats, individuals or populations.

The plan (pg. II-27) also contains threatened and endangered species management standards but at the time, no forest carnivore was federally listed as 'threatened' or 'endangered.' The lynx, of course, was federally listed 'threatened' in 2000.



The Deerlodge National Forest Plan was completed in 1987. It too identified "Management Indicator Species" (Forest Plan FEIS, 1987, p. III-26) but while the former Beaverhead National Forest listed the pine marten as an MIS, the Deerlodge National Forest did not. The plan was subsequently appealed for a variety of reasons. In a settlement agreement during the appeal of the plan, the Forest Service agreed to use the pine marten as an MIS (unpublished, 1989 Settlement Agreement, FS actions, item A5a).

As was the case with the Beaverhead Plan, specific management direction for forest carnivores is lacking in the Deerlodge Forest Plan. Very broad goals, objectives, and standards are provided that are open to interpretations. For example: "...maintain habitat for current wildlife populations..." (pg. II-1). Yet it is impossible (now, as it was then) to even know what the populations are, let alone maintain habitat to support them. Another statement reads: "...coordinate travel management restrictions to protect unique habitats..." (pg. II-18). Was the intent here to emphasize big game habitat? It would seem so if one reads the adjacent standards. Even if the standard is broadly interpreted to include unique habitat for other species (such as wolverine denning habitat), to what extent are we to protect habitat? Do unique habitat needs take precedence over human uses?

The Beaverhead and Deerlodge Forest Plans did not provide specific enough tools to manage or monitor wildlife, particularly forest carnivores. This is not an indictment of the Forest Plan authors; after all, forest carnivores were not at issue when these plans were written. Forest Plans throughout the nation were similarly deficient in wildlife direction (WMI 1990). To this day very few studies have been conducted on forest carnivores relative to other species. Only in hindsight do we realize how the Forest Plans

outlined some specific programs and outputs on one hand, but then offered few wildlife tools short of assuring compliance with the Endangered Species Act.

Compounding the lack of specific direction, the concepts of *minimum viable populations* and *management indicator species* (handed down through the NFMA) are problematic to begin with (see for example, Gilpin and Soule 1986); they are even more so when applied to rare, far-ranging forest carnivores.

Through the 1980's and much of the 1990's, wildlife biologists were left in the quandary of working on complex projects with sparse tools and few data. The Wildlife Management Institute (1990), at the request of the USFS to review the agency's fish and wildlife programs, summed up the situation well:

“Faced with management decisions that sometimes are controversial, and with inadequate plans to guide them, reactive crisis management is the rule for USFS wildlife and fish biologists. Once embedded in controversy, biologists spend less time in the field, when they should be assembling and expanding databases to build and support a proactive wildlife and fish program. Without a well defined program, projects are often conducted on an ad hoc basis, and post-project monitoring and evaluation generally go lacking.”

This is the primary reason that specific information on forest carnivores is lacking even today.

The Forest Service focused on individual species management through the first generation of forest plans. The species by species approach stretched agency resources. As featured species lists grew, the ability to produce quality assessments became more difficult. Sometime the individual species emphasized had mutually exclusive habitat needs in the same project area. This approach focused on the compliance process.

However, the expanding issues led the Forest Service on a path to examine larger and larger project areas.

Ecosystem management emerged as the new paradigm as land managers, including wildlife biologists, began taking a broader, longer view of habitats. Some individual species are still emphasized, but the Forest Service started considering communities such as old growth forests, riparian areas, and sagebrush/grasslands and the suite of species dependent on these communities. The forest carnivore conservation assessment (Ruggiero et al. 1994) was a product of this era.

#### Forest Plan Revision

The first round of forest plans underwent considerable scrutiny. In 1989, the agency started a comprehensive review of its land management planning process. By 1995, the Forest Service drafted some revised planning regulations but these were never implemented. In December 1997, the Secretary of Agriculture convened the 'Committee of Scientists' to review the Forest Service planning process and offer recommendations for improvement. The committee released their report in March 1999 (Johnson et al., 1999). Based on the committee's findings and on other public input, the Forest Service recently released new planning regulations (36 CFR 217 and 219: 67514 Federal Register/ Vol. 65 No. 218/Thursday, November 9, 2000).

These new planning regulations will affect how wildlife is managed on National Forest System lands. Under the new rule, the FS will emphasize ecosystems, with maintenance and restoration managed in the context of 'expected range of variability.'

Commodity outputs may become more of a byproduct of stewardship efforts, not necessarily a goal in and of themselves. The FS will recognize that habitats are not static, but change over time to provide a shifting mosaic of conditions. The concept of viability will shift to a requirement that the FS maintain habitat that provides a 'high likelihood' of supporting the viability of wildlife. The species by species approach will be modified by a system that focuses on a few select species. Important 'focal species' are emphasized (such as economically important species like elk) along with 'species-at-risk.' The forest carnivores will undoubtedly be included in the focal species category.

#### Existing Situation

While the evolution of planning regulations posed technical challenges to managing for forest carnivores (and of course other wildlife), some institutional challenges affected the performance of the wildlife biologists in their duties. The largest obstacles to a diversified program continue to be budget limitations and workload management.

The majority of the biologists' work and funding continues to be derived from environmental impact analysis. Through the near future, this will continue to be the case. Projects will continue to be implemented in accordance with the existing Forest Plans and wildlife biologists will need to manage the challenges of the current system versus the new regulations.

The wildlife staff of the Beaverhead & Deerlodge National Forest has tried to develop and broaden the wildlife program. The staff has produced a series of program documents in an attempt to balance the duties of environmental impact analysis with

proactive duties such as habitat enhancements, inventory and monitoring (Sundstrom 1978, Anonymous 1980, Holland and May 1990, Mariani 1994, Bowey 1998, all unpublished internal reports). Until wildlife budgets improve and workloads are better managed, the wildlife program (including forest carnivore management) will not reach its potential.

## RECOMMENDATIONS

The mission of the B-D NF Wildlife Program has been articulated in different ways, in different planning documents. Essentially, its mission is to maintain, restore, or preserve the integrity and quality of all aquatic and terrestrial communities of plant and animal life, within the context of national, regional and forest programs and in consideration of customer needs and desires.

Similarly, the vision of our program has been articulated in different ways. Here are a few vision statements: The program's efforts result in healthy, diverse populations of wildlife. The program is diversified. It nurtures partnerships to help stretch limited funds. It involves future generations of stakeholders as children are provided conservation education. Inventory and monitoring results contribute to adaptive management and provide information for solid, defensible decision-making. Cooperation with state, university and private sector makes research possible. Finally, marketing and accountability demonstrate the value of investing time, energy and money in the world-class wildlife resources of the Forest.

To implement our mission and achieve our visions, a healthy, balanced wildlife program should be composed of several 'program elements' beyond environmental

impact analysis (as shown in the Program Management and Budget short course, USFS Continuing Education series). ‘Program elements’ are aspects of the job or mission that, managed properly, contribute to a successful program. They include: information management, inventory and monitoring, resource coordination (including ecosystem planning), information and education, research and technical, interagency coordination (communication), partnership management, habitat restoration, and budget/marketing/accountability.

Many of these program elements are interwoven. Following is a summary of what activities (if any) are ongoing in these areas on the B-D NF and what strategic activities are suggested to improve the program as it relates to forest carnivores.

### *Information Management*

Quality information is the cornerstone of any additional efforts for forest carnivores. We must be aware of what is already known and where information gaps exist.

*Ongoing Activities:* The B-D NF currently has both GIS and database capabilities. These tools have been integrated to produce spatial displays and data sets for lynx habitat. Also available is a project database that lets us query what projects are ongoing in a given “lynx analysis unit” (Ruediger et al. 2000).

*Strategic Activities:* The Forest-wide lynx database must be edited to include an occurrence data field. We must be able to answer specifically where and when lynx were documented. We must expand the database to include variables for the other forest

carnivores and their prey. Finally, we need to modify the habitat variables to include linkage zones within and adjacent to the B-D NF.

The biologists are aware of the database and of the GIS capabilities but most are not trained to use it at their desktops. These technical tools are becoming fundamental to the job and make complex, broad scale assessments relatively easy to execute. We should make training on these tools a priority. At least one biologist or technician can take primary responsibility for maintaining the tools in cooperation with the Computer Staff.

Concurrently, the district biologists must become aware of modeling and database efforts taking place at the regional and national level. The FS Northern Region Office has been working with the Wildlife Spatial Analysis Lab at the University of Montana to develop broad scale analysis of wildlife habitats. District biologists are in need of an update as to the products of this effort and how they might be used. Meanwhile, R. Wiseman (USFS, personal communication) has been working on a team to develop and implement the national 'Fauna Model.' This ArcView-based model will combine GIS layers with animal occurrence data to model potential habitat. It will also maintain a database of all animal occurrences. The interactive model should be available within a year. Biologists can prepare for its arrival by compiling and categorizing all occurrence data that now exist in scattered files. If we enter these data into a single database, they can be more easily migrated into the Fauna Model when it becomes available.

## *Inventory and Monitoring*

This element is closely tied to information management. Huge gaps exist in our local knowledge of forest carnivores. The most fundamental question is: “Where do the forest carnivores occur?”

*Ongoing Activities:* Various surveys have been underway for several years.

These include:

- Remote camera stations following Zielinski and Kucera (1995) as well as non-standardized deployment. Over time, both standardized and non-standardized deployments have occurred on the Pintler, Dillon, Wisdom, Wise River and Madison RD's (B. Conard, USFS, personal observation, R. Wiseman and T. Komberec, USFS, personal communication).
- Fixed snow tracking transects in cooperation with FWP and the National Fish and Wildlife Foundation (Forkan and Kujala 1999, Forkan 2000), and as part of the Madison Ranger District program (R. Wiseman, USFS, personal communication).
- Lynx hair snagging surveys in the Pioneer Mountains and near Georgetown Lake following the national test protocol (McKelvey et al. 1999), and on the Madison Ranger District using earlier methods (R. Wiseman, USFS, personal communication).

*Strategic Activities:* Once we unify and standardize the wildlife program's information management, we need to consolidate the existing occurrence data. Then we can use the system to identify information gaps and can focus detection efforts where they will provide the greatest payoff. Meanwhile, we must also keep abreast of current detection methods and protocols. For example, Foresman and Pearson (1998) tested the efficacy of the carnivore detection methods (Zielinski and Kucera 1995) on the Bitterroot NF and suggested improvements to each method. These suggestions have not been integrated into our detection methods.



Monitoring is not being conducted for forest carnivores. We need to clarify our responsibility and develop a monitoring strategy.

### *Research and Technical*

This program element is closely tied to inventory and monitoring. It differs in that it usually involves partners such as the universities or the research station. Where inventory and monitoring focuses on detection, the aim of the research and technical element is to solve applied management problems with research or administrative studies.

*Ongoing Activities:* The USDA-FS Rocky Mountain Research Station, in cooperation with the Federal Highway Administration and the B-D NF, has started a study of lynx occurrence, movements, and habitat use in the Pioneer Mountains.

*Strategic Activities:* The B-D NF can continue to participate in support of the above research. A need for similar research on wolverine and possibly fisher exists. In part, our ability to host such research will be related to the vigor of our other program elements (such as information management and partnership management).

### *Resource Coordination*

This program element continues to be the primary function of wildlife biologists on the B-D NF. Our responsibility is to help manage the wildlife resources in balance with other programs and outputs. The manner in which we manage this program element is critical. Biologists currently play a limited role in determining district work plans and are in a reactive mode relative to the workload. Workloads continue to be heavy relative to the number of biologists and the timeframes planned. Walk-in work materializes on a

week-by-week basis. Consequently, individual project work is fragmented; biologists struggle to focus on a given project in the face of short-fuse interruptions and shifting priorities.

*Ongoing Activities:* The Forest Leadership Team has taken steps to provide some relief in this regard. They developed a formal process to help prioritize and then fund projects according to priority. Biologists must participate in this process whenever possible and must also work with their rangers and district staff to either stick to priorities once they are set, or rework the priority list.

*Strategic Activities:* Once the program of work is in place, biologists must communicate their needs to project managers. Project proponents should not constrain biologists from assembling scientifically sound assessments. Conversely, biologists need to be cognizant of the fact that budgets are decreasing while planning costs are increasing. Interdisciplinary teams must work efficiently but realize that cutting too many corners can be self-defeating if projects are appealed and litigated.

Biologists also need to coordinate among each other even more, so that individual district biologists do not become overloaded with resource coordination work (at the expense of their wildlife program work). Biologists could provide project support across district boundaries.

The B-D NF could improve its wildlife assessments in several ways. While ‘boilerplates’ of wildlife assessments can be used to help expedite projects, they must be used carefully. Biologists must be sure to take a fresh look at projects and to incorporate enough site-specific information coupled with the best scientific information available. A wave of new literature is available regarding lynx and other forest carnivores.

We could benefit from internal peer review of drafts. Although this is more work up-front, it would provide payoffs of improved quality, perhaps preventing some appeals and litigation. Peer review would also expose biologists to the work of others so that we might share ideas and approaches.

Project effects on forest carnivores need to be put in perspective. Very few projects will have landscape level implications, yet biologists must work with regulatory language that speaks to the scale of ‘viability’ and ‘population trends.’ We need to reconcile some thresholds for project effects so that individually insignificant projects do not cumulatively affect a population. The challenge will be to consider projects in the appropriate context and to conduct an adequate cumulative effects analysis. If a project has serious implications because of its proximity, or because of incremental cumulative effects, then it must be modified, scrutinized for viability concerns, or disallowed (FSM 2672).

Heinemeyer and Jones (1994) recommend a hierarchical approach to fisher management based on the coarse-filter strategy suggested by Hunter (1991). This method allows us to address several scales of management concerns, ‘from maintenance of genetic linkages between metapopulations, to management of resting or foraging habitats at the stand level’ (Heinemeyer and Jones 1994). Forest projects could apply these guidelines from the stand level through at least the subdrainage level. Meanwhile, landscape assessments (discussed more below) could apply the strategy from at least the ‘subdrainage’ level through the ‘physiographic area’ level. The Canada Lynx Conservation Strategy and Assessment (Ruediger et al. 2000) is geared toward this approach. A scaled approach is also suggested by Lyon et al. (1994).

### *Ecosystem Planning*

This activity is related to resource coordination, but applies to a larger scale. Ecosystem planning is done during landscape assessments and will also take place with revision of the forest plan.

*Ongoing Activities:* Landscape Assessments are still underway. Biologists must apply what we've learned to future landscape assessments and should revise past efforts within their jurisdiction. The Landscape Assessments provide a wealth of information about ecosystem attributes including vegetation, fire ecology, recreation, infrastructures such as roads, and much more. Most of these landscape features are somewhat fixed and quantifiable. The wildlife resource is not so. 'Wildlife' is inherently difficult to describe and quantify. Consequently, the quality of the wildlife information contained in the assessments is variable, reflecting the timelines of the projects, funding levels, staffing, and existing information.

Important forest carnivore information gaps are evident in the assessments. The landscape assessments typically provided a basic inventory of what species occur in a given landscape but the assessments revealed almost nothing about wildlife populations, movements or local habitat associations. This is especially true of the forest carnivores, where we do not even have a basic inventory. New issues have emerged since most landscape assessments were completed, for example, the issue of potential conflict between backcountry winter recreation and wolverine den sites.

One consistent finding of the landscape assessments: in the absence of fire disturbance, insects and disease have become a major force in shaping the structure and

composition of the forested communities. To an extent, insect and disease agents improve habitat conditions for forest carnivores at the stand level by creating feeding, resting, and breeding habitat (structural complexity). Mature forests are the foundation of forest carnivore habitat. However, the landscape-level effects of fire suppression, resulting in potentially ‘un-natural’ fire regimes, are a major consideration in forest carnivore management that has been largely overlooked.

In retrospect, some of the landscape assessments will need to have information added if they are to contribute forest carnivore management recommendations to Forest Plan revision. At the minimum, they will need to be edited to reflect the information gaps. In that way at least, important issues are not overlooked during potential resource allocation (such as travel planning).

*Strategic Activities:* Whenever possible, it is appropriate to use these broad scale assessments to focus survey and detection efforts on unknowns. If costs are prohibitive, biologists should display what is known, what is needed, and suggest a strategy for adaptive management. The biologists must manage the uncertainty and preserve options.

Biologists should not duplicate vegetation description efforts. They should allow the vegetation specialists to describe their resource but can make habitat interpretations. Biologists can also help describe the ‘range of habitat variability’ as it relates to different species. Whenever possible, apply the hierarchical approach to habitat descriptions. This way the landscape assessment can at least provide an estimate of the ‘nested’ importance of habitats within and between landscapes. See the Madison Range Landscape Assessment (1995) as an example; note how the biologists ranked wolverine habitat in different portions of the landscape and then related these zones to each other.

R. Wiseman (USFS, personal communication) suggested revisiting the whole foundation for landscape assessments. He observed that vegetation is often the background focus and foundation for the assessments. In other words, we often inventory vegetation, try to describe a natural range of variation, and then suggest treatments to the vegetation. Wiseman suggested we begin the assessment by considering the landscape for its numerous values, such as habitat, for example. Instead of looking at a forest as ‘overmature’ and then mitigating logging effects on forest carnivores, we could describe the needs of the forest carnivores in the context of the landscape and look for ways to improve the habitat through silviculture, fire management, or recreation management.

Some ‘dovetailing’ of the landscape assessments will be needed. In light of the effects of highways and development, linkage zones between landscapes are a major conservation concern for forest carnivores (Ruediger 1996). The biologists need to work together to describe how the landscapes fit together to provide a network of habitats and dispersal opportunities. Biologists must also coordinate this information with adjacent jurisdictions. The Forest staff identified landscape boundaries to coincide with watershed boundaries. Sometimes artificial ‘administrative’ boundaries were used (such as national forest or state boundaries). Artificial boundaries are problematic when we consider forest carnivores. These species are typically associated with core forest habitat within mountain ranges. Such artificial boundaries are often drawn on the crests of mountain ranges. Consequently, such boundaries ‘fragment’ our management efforts by creating patchy data sets, jurisdictions, management directions, and even agency missions.

### *Intra-Agency Coordination*

Forest carnivores transcend agency jurisdictions. Close coordination is critical.

*Ongoing Activities:* We have been communicating some limited forest carnivore information with FWP, USFWS, and BLM. These have been related to the lynx listing process and some limited winter snow surveys.

*Strategic Activities:* We must improve our information exchange with other agencies. We must broaden our communication with FWP regarding forest carnivores. Harvest information is invaluable, yet we do not regularly ask for summary results of the seasons. If nothing else, harvest information helps monitor forest carnivore distribution and occurrence. Likewise, we need to regularly exchange data with Montana Natural Heritage Program, the BLM, and neighboring FS districts, forests, & regions.

### *Partnership Coordination*

*Ongoing activities:* Some partnerships are in place. The B-D NF is cooperating with the USDA-FS Rocky Mountain Research Station, the Federal Highway Administration, FWP, the National Fish and Wildlife Foundation, and the BLM to conduct forest carnivore work. Considering the high cost of conducting forest carnivore work, we must continue to identify and nurture partnerships.

*Strategic activities:* The Forest Service must try to work more proactively with stakeholders such as conservation interests and user groups. These groups often view the FS as an adversary. The FS then spends precious resources reacting to controversy. The FS can try to ‘front load’ the process by meeting stakeholders more regularly and in a positive atmosphere of information exchange. For example, we can meet with

conservation groups to communicate our efforts and to hear their concerns. Likewise, we can meet with user groups to understand their interests, and to dispel myths or rumors about our activities.

### *Habitat Restoration and Improvement*

*Ongoing Activities:* The B-D NF wildlife program has not conducted habitat enhancement projects for forest carnivores. Some timber sale area improvements are proposed on the Pintler RD (Upper Camp-Duncie KV Plan, Boulder-Wyman KV Plan). These untested methods propose creating piles or structures of logs within previously harvested areas in an effort to leave a structural legacy in the regenerating stand for forest carnivores. This concept will need more study and refinement.

*Strategic Activities:* Considering recent wildlife budgets, the wildlife program may not be spearheading any major habitat improvement efforts in the near future. However, the wildlife program could turn the tables on some resource programs. For example, instead of mitigating the effects of timber harvest on forest carnivores, the timber program can help the wildlife program achieve habitat objectives through silviculture (with the by-product of such an effort being some timber resources). Similarly, some landscape assessments showed a change in forest structure and composition due to fire exclusion. The wildlife program can suggest some areas for fire restoration. Traditionally, the natural fuels program has focused on grassland and conifer encroachment areas. One type of treatment currently lacking is prescribed, stand-replacement patches. This type of planned ignition could be applied to the most remote



non-wilderness areas but needs careful consideration and planning because it will be both technically difficult and politically challenging.

### *Environmental Education*

*Ongoing Activities:* The wildlife staff currently provides environmental education on an as-requested basis.

*Strategic Activities:* Biologists can get much more proactive by assembling forest carnivore programs and advertising their availability. Much mystery, confusion and misinformation surrounds forest carnivores. We need to help share accurate information not only to the traditional audiences (children) but also with adults and peers.

### *Budget, Marketing, and Accountability*

*Ongoing Activities:* District biologists currently coordinate a unified (i.e., centralized, forest-wide) wildlife budget. We have coordinated on equipment needs (such as one set of snowmobiles available to conduct surveys) and for temporary help (such as Pintler RD technicians surveying the Pioneer Mountains for carnivore tracks).

*Strategic Activities:* First, with a changing budget process and structure, it will become even more important for biologists to become involved and to learn budgeting rules and procedures.

Second, the wildlife program needs a better marketing strategy. Marketing can target both internal and external audiences. Externally, a simple brochure or a presentation to local interest groups can share our activities and accomplishments. Meanwhile, I've found that co-workers in other resource areas on our districts are not

always aware of what biologists are doing in the way of forest carnivore management (surveys, conservation strategies, etc.). Yet, when they hear tidbits of information, they are interested. Internally, we can capitalize on this interest to better demonstrate the value of a wildlife program apart from resource coordination.

Along that line, we need to reward non-biologists among us who support our work. Some non-biologist peers have helped further the wildlife program; be they line officers who support the biologist conducting carnivore surveys, or a writer-editor who helps put together an education trunk.

Finally, the wildlife program could benefit from more formalized, internal program of work and accomplishment report. This way we can articulate to line officers what a healthy wildlife program looks like, what will suffer with inadequate funding, and what we have accomplished.

## CONCLUSION

All subunits of the Beaverhead-Deerlodge National Forest support populations of at least one of the four forest carnivores. The Forest Plans did not provide specific enough tools to manage or monitor forest carnivores. The Forest Service recently released new planning regulations that will affect wildlife management but through the near future, wildlife biologists will need to manage the challenges of the current system with the new regulations. Forest staff has completed some broad scale assessments of resource conditions in preparation for forest plan revision. The assessments provide a wealth of information about ecosystem attributes but are generally deficient in addressing

forest carnivores. In retrospect, some of the landscapes will need addendums if they are to contribute forest carnivore management recommendations to Forest Plan revision.

Meanwhile, the wildlife program can improve upon its program elements to better manage forest carnivores as well as other species. For example, we must improve our database, GIS and information management methods. Resource coordination will remain the primary function of wildlife biologists on the B-D NF in the near future. These duties can be greatly enhanced by better workload management, improved assessment techniques and internal peer review. Habitat enhancement projects can be achieved through close coordination with programs like silviculture or fire.

We must improve our information exchange with other agencies, continue to identify and nurture partnerships, and should try to work more proactively with stakeholders such as conservation interests and user groups. Biologists can capitalize on the interest in forest carnivores to improve environmental education programs and can broaden them to include adult audiences.

With a changing budget process and structure, it will become even more important for biologists to become involved in program management. The wildlife program also needs better marketing and accountability. We need to articulate to line officers and other internal and external customers what a healthy wildlife program looks like, what will suffer with inadequate funding, and what we have accomplished.

With support and cooperation, we can manage forest carnivores in a manner that better protects the resource, contributes toward agency goals, is more efficient, provides state-of-the-art support, and builds customer satisfaction.

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